FINDING OF NO SIGNIFICANT IMPACT
POND CREEK SALT MARSH RESTORATION PROJECT
SECTION 1135, ECOSYSTEM RESTORATION
CAPE MAY COUNTY, NEW JERSEY

OVERVIEW

The United States Army Corps of Engineers (Corps) has evaluated the restoration of tidal flow from the Delaware Bay into Pond Creek. Pond Creek is located in Lower Township and the Borough of West Cape May, Cape May County, New Jersey.

PURPOSE AND SPECIFICATIONS

The purpose of the Pond Creek Salt Marsh Restoration Project is to restore estuarine intertidal emergent wetland habitat for fish and wildlife resources. This will be accomplished by reintroducing tidal flushing in the lower marsh areas of Pond Creek to eliminate and control common reed (*Phragmites australis*), an exotic and invasive species which has formed an extensive, dense stand throughout most of Pond Creek marsh. Once established, *Phragmites* often out competes native salt marsh vegetation, creating habitat less suitable for wildlife. Control of common reed will allow the reestablishment of native salt marsh vegetation [e.g., smooth cordgrass (*Spartina alterniflora*), salt hay grass (*S. patens*), and spike grass (*Distichlis spicata*)], thus increasing habitat available for a variety of fish and wildlife resources, in particular, the diamondback terrapin (*Malaclemys terrapin*), egrets, herons, shorebirds, and waterfowl.

The Pond Creek marsh (totaling 417 acres) is located along the Delaware Bay and runs north of Sunset Boulevard in Lower Township and in the Borough of West Cape May, Cape May County, New Jersey. The marsh, once a free-flowing estuarine tidal marsh before human disturbance, is part of the State of New Jersey's Higbee Beach Wildlife Management Area. The State's Division of Fish and Wildlife currently manages the marsh for migratory bird and waterfowl habitat and human recreation (e.g., birding and hunting). The marsh is bordered by vegetated dunes [beach grass (*Ammophila breviligulata*)] to the west and abandoned railroad tracks supporting red cedar (*Juniperus virginiana*), northern bayberry (*Myrica pensylvanica*), and wax myrtle (*Myrica cerifera*) to the south. A portion of Pond Creek marsh extends south of the abandoned railroad tracks and is bordered by agricultural land, residential development, and small patches of upland forest. The eastern portion of Pond Creek is bordered by agricultural lands with upland forest buffers. The northern portion of Pond Creek is bordered primarily by upland forest with several agricultural fields. An upland forested island is situated in the middle of the Pond Creek marsh, known as Sassafras Island. A small open freshwater area identified as Davey's Lake is situated northwest of the marsh. Pond Creek is almost entirely freshwater wetlands, as a result of a tide gate installed in 1917, at the mouth of Pond Creek, which flows into the Delaware Bay. The tide gate has since deteriorated and been removed. Due to the small size of the creek and the sinuosity of the channel, very little bay water is currently getting into the marsh to flood the *Phragmites*.

The Corps, U.S. Fish and Wildlife Service, and project partners have identified that constructing a new channel and water-control structure is the least costly and simplest method of reintroducing tidal flow to the marsh and controlling *Phragmites*. The proposed project will include construction of a 920-foot section of new stream channel to shorten the distance between the Bay and the marsh, thus increasing the amount of tidal flow into the marsh and reducing the potential for inlet migration. Upon digging the new channel and inundating the marsh, *Phragmites* will be eradicated or greatly controlled in the Pond Creek marsh. This will allow native, more beneficial marsh vegetation to reestablish. The native vegetation will provide greatly improved habitat for diamondback terrapins, migratory songbirds, wading birds, shorebirds, and waterfowl. In addition, the water-control structure will throttle the tidal inundation to Pond Creek protecting freshwater wetlands in the upper portions of the marsh.

COORDINATION
The project was developed by cooperating agencies including: the U.S. Army Corps of Engineers, the New Jersey Division of Fish and Wildlife (NJDFW), the Cape May County Mosquito Extermination Commission, Ducks Unlimited, Incorporated, and the U.S. Fish and Wildlife Service.

The Draft Environmental Assessment (EA) for the project was forwarded to the U.S. Environmental Protection Agency, Region II, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the NJDFW, and all other known interested parties.

ENDANGERED SPECIES IMPACT
The Environmental Assessment has determined that the selected plan, if implemented, would not jeopardize the continued existence of any species or the critical habitat of any fish, wildlife or plant, which is designated as endangered or threatened pursuant to the Endangered Species Act of 1973 as amended by P.L. 96-159.

WATER QUALITY COMPLIANCE
Pursuant to Section 401 of the Clean Water Act, a 401 Water Quality Certificate will be obtained from the New Jersey Department of Environmental Protection, Land Use Regulation Program prior to project construction.

COASTAL ZONE
Based on the information gathered during the preparation of the Environmental Assessment, and the application of appropriate measures to minimize project impacts, it was determined in accordance with Section 307(C) of the Coastal Zone Management Act of 1972 that the plan complies with and can be conducted in a manner that is consistent with the approved Coastal Zone Management Program of New Jersey. A consistency determination from the New Jersey Department of Environmental Protection will be received prior to project construction.

CULTURAL IMPACTS
The proposed project will not affect any historic or archaeological sites eligible or listed on the National Register of Historic Places. As such, no impacts are expected on historic or archaeological resources.

RECOMMENDATION
Because the Environmental Assessment concludes that the work described is not a major Federal action significantly affecting the human environment, I have determined that an Environmental Impact Statement is not required.

_____ _____

Robert J. Ruch
Lieutenant Colonel, Corps of Engineers
District Engineer

Date

DRAFT
ENVIRONMENTAL ASSESSMENT

POND CREEK SALT MARSH RESTORATION PROJECT
SECTION 1135, ECOSYSTEM RESTORATION
CAPE MAY COUNTY, NEW JERSEY

PREPARED BY:
PHILADELPHIA DISTRICT
U.S. ARMY CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA 19107

AND

NEW JERSEY FIELD OFFICE
U.S. FISH AND WILDLIFE SERVICE
PLEASANTVILLE, NEW JERSEY 08232

June 2005

DRAFT
ENVIRONMENTAL ASSESSMENT
POND CREEK SALT MARSH RESTORATION PROJECT
SECTION 1135, ECOSYSTEM RESTORATION
CAPE MAY COUNTY, NEW JERSEY

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1.0 Project Location

The Pond Creek Restoration Project is located along the Delaware Bay and runs north of Sunset Boulevard in Lower Township and in the Borough of West Cape May, Cape May County, New Jersey (Figure 1). The project site is located in New Jersey's 2nd Congressional District. Additionally, the project area is within the Cape May peninsula, an important stopover and foraging area for birds migrating along the Atlantic Flyway.

2.0 Study Authority

The U.S. Army Corps of Engineer's (Corps) study authority for the Pond Creek Restoration Project is Section 1135 of the Water Resources Development Act of 1986, as amended, which is used for improvements to the environment in the public interest. The Section 1135 linkage for this project is the New Jersey Intracoastal Waterway. In 1941-42 a canal 12 ft deep and 100 ft wide from Cape May Harbor to Delaware Bay was constructed. The canal construction required the excavation of an existing tidal creek and damaged over 300 acres of wetlands. The U.S. Fish and Wildlife Service's (Service) authority for the subject restoration project is pursuant to the Service's *Coastal* Program.

3.0 Purpose and Need for Action

The purpose of the Pond Creek Salt Marsh Restoration Project is to restore estuarine intertidal emergent wetland habitat for fish and wildlife resources. This will be accomplished by reintroducing tidal exchange in the Pond Creek wetlands (Figure 2) to eliminate and control common reed (*Phragmites australis*), an exotic and invasive species which has formed an extensive, dense stand throughout most of Pond Creek marsh. Once established, *Phragmites* often outcompetes native salt marsh vegetation, creating habitat less suitable for wildlife. Control of common reed will allow the reestablishment of native salt marsh vegetation [e.g., smooth cordgrass (*Spartina alterniflora*), salt hay grass (*S. patens*), and spike grass (*Distichlis spicata*)], thus increasing habitat available for a variety of fish and wildlife resources, in particular, the diamondback terrapin (*Malaclemys terrapin*), egrets, herons, shorebirds, waterfowl and a variety of other wetland-dependent wildlife.

There will be a number of benefits derived from the Pond Creek Salt Marsh Restoration project. Increasing the diversity of vegetation within the wetlands will enhance fish and wildlife habitat. The Pond Creek wetlands currently provide limited habitat for fish and wildlife resources due to the overwhelming presence of dense stands of common reed, which provides limited habitat value for fish and wildlife. Reducing common reed improves habitat value and diversity. Improving diversity within the wetland would also improve the aesthetics of the project site. By opening up the Pond Creek wetlands visually, the general public would be better able to fish, hunt, bird-watch, and conduct environmental studies. Eradicating *Phragmites* would also eliminate the need for the Cape May County Mosquito Commission to spray insecticides in and around marshes and residential areas. The project will also improve water quality within Pond Creek (*e.g.*, total dissolved solids, biological oxygen demand, fecal contamination (coliforms)) by improving tidal flushing of the marsh. Reducing the biomass of *Phragmites* will also decrease the chance and risk of a catastrophic wildfire occurring and damaging residential property in the area. The project may also alleviate some current flooding problems that are experienced due to *Phragmites* blocking outlet structures and impeding upland drainage.

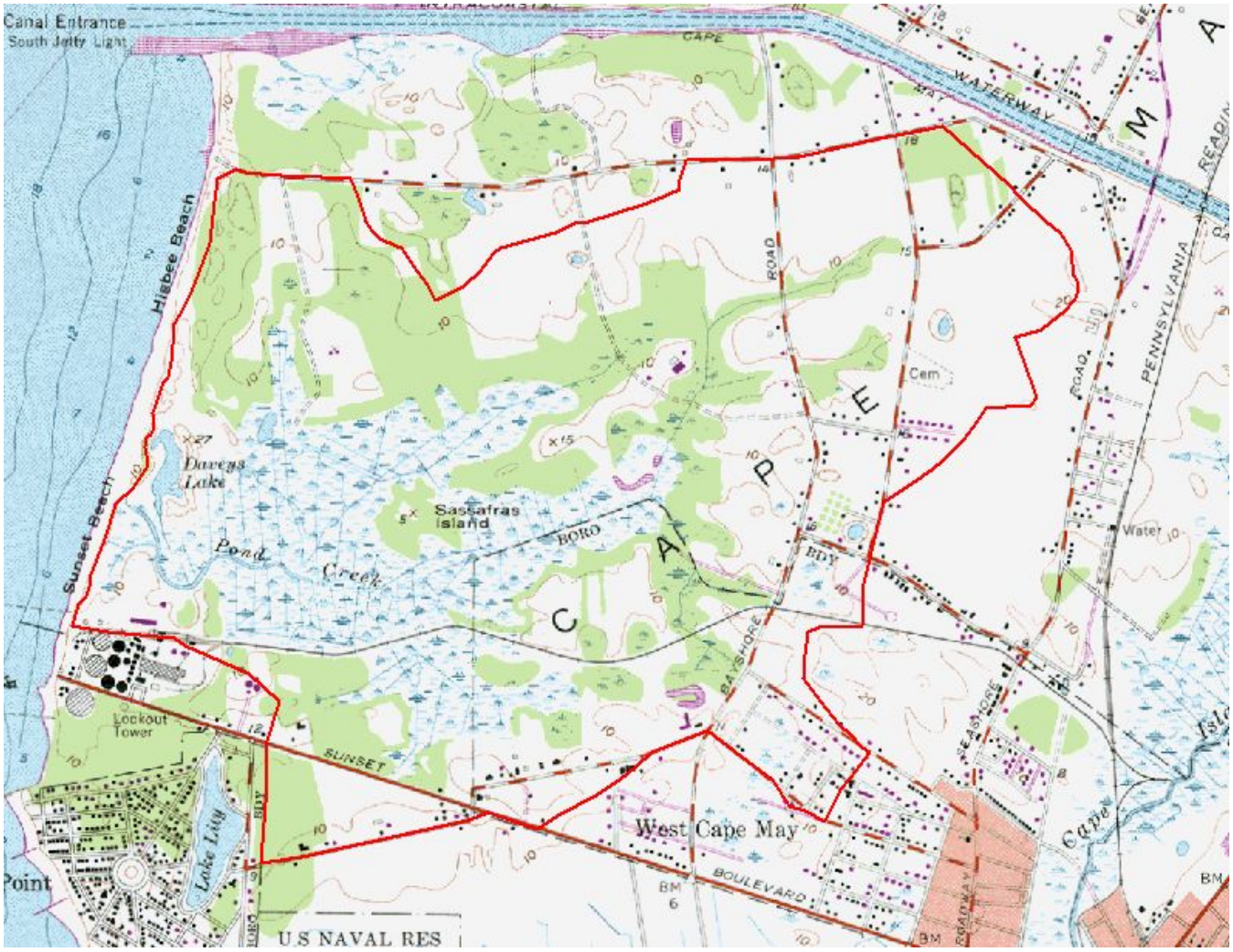

Figure 1. Pond Creek project area.

Figure 2. Aerial photograph of Pond Creek watershed.

4.0 Alternatives

Due to the nature of this project, a limited number of alternatives are available to achieve the goals of ecological restoration while be sensitive to environmental and engineering criteria. The alternatives include no-action, invasive species control, and various structural design measures. For discussions in this document all elevations are using the NAVD88 coordinates system. There were six alternatives considered for the project:

- No-action
- Invasive Species Control - Chemical (herbicide spraying)
- Invasive Species Control - Flooding (four alternatives)
    - Freshwater flooding
    - Full tidal inundation with earthen berms
    - Tidal inundation with water-control structure (existing channel)
    - Preferred alternative - Tidal inundation with water-control structure (new channel alignment)

4.1 No-action

The no action alternative would leave Pond Creek as a palustrine emergent wetland with a failed dune and outlet structure. The current outlet structure has failed and Pond Creek is in the process of returning to a more natural alignment. There is limited flow currently moving through Pond Creek and the local littoral drift often deposits sand at the outlet further limiting outflow from Pond Creek. The Cape May County Mosquito Extermination Commission is often called in to clear the outlet to prevent flooding within Pond Creek due to rain events. The project area would remain dominated by a monoculture of *Phragmites*. The goal of the project is to restore native salt marsh. The no action alternative will not achieve the project goal. This will have long-term negative impacts on the potential wildlife use of the area. *Spartina* marshes have been proven to provide considerably more benefits to wildlife than *Phragmites* marshes. Elimination of dense stands of *Phragmites* and re-establishment of native vegetation will improve habitat quality for anadromous fish, waterfowl, waterbirds, raptors, and furbearers by increasing desirable food plant abundance, invertebrate production, habitat heterogeneity, and open water space.

This predominance of *Phragmites* provides limited fish and wildlife habitat within the project area and provides numerous areas for mosquito breeding. As a result, the Cape May County Mosquito Extermination Commission would continue to spray Pond Creek with adulticide and larvicide on a yearly basis to control mosquito populations. Beach and dune areas would remain unchanged. This alternative was eliminated from consideration because it does not accomplish the goal of improving the ecological functions and values of Pond Creek.

4.2 Invasive Species Control - Chemical

The invasive species control alternative would target control of *Phragmites* within the wetland areas. Control of *Phragmites* can be accomplished with chemical spraying, flooding, and tidal inundation. Control of *Phragmites* using chemical control involves aerial application of glyphosate-based herbicide in the fall. This is followed up by a prescribed burn to eliminate the dead, standing biomass. Typically a second application of herbicide is required to eliminate those *Phragmites* plants that were not affected by the initial application. This alternative typically has good results of eliminating *Phragmites* for 5 to 10 years. However, without a change in topography or hydrology within the wetland, the conditions remain unchanged for recolonization of *Phragmites*. It is likely that chemical control of *Phragmites* alone is a short-term control alternative. In addition, this control option does not eliminate mosquito breeding habitat. This alternative was eliminated from consideration, because it does not provide long-term ecological improvement within the Pond Creek wetlands.

4.3 Invasive Species Control – Freshwater Flooding

Phragmites control can also be accomplished by flooding *Phragmites* areas. Typically these areas need to be inundated with at least 4-6 inches of water for the majority of the year in order to get good control (Dodici and Schrading, 2003). Pond Creek could be flooded by retaining precipitation on the site, but it would require significant work to the existing berm and installation of a water-control structure. In addition, this option would likely result in flooding of adjacent lands during rain events, due to the loss of storage capacity within Pond Creek. This alternative does not achieve the project goal of restoring estuarine intertidal emergent wetland habitat This alternative was also eliminated from consideration due to engineering concerns and concerns of adverse impacts to adjacent property owners.

4.4 Invasive Species Control – Tidal Flooding - full tidal inundation with earthen berms

This alternative involves enlarging the existing creek channel to a bottom width of 10 ft and lowering the bottom elevation from -2 ft to -6 ft to increase the volume of water entering the marsh. This alternative would involve constructing an approximately 4200 foot long dike (10 ft in height) across the back portion of the marsh and raising 2900 feet of the abandoned railroad by 7 feet (Figure 3). The alignment of the dike is shown in Figure 3. For the north marsh there would be 166 acres of salt marsh downstream of the dike and 104 acres upstream of the marsh that would serve as a storage area for rain runoff. The dike would be constructed with pipes through it and fitted with flap gates to allow for the movement of rainwater from areas outside the marsh to areas within the marsh. The abandoned railroad (elevation +4 ft) would be raised. Two existing 18" diameter pipes through the railroad will be cleaned out and fitted with flap gates. The constructed dike would prevent daily tide and Delaware Bay storms from impacting local residents who live adjacent to the marsh. This alternative would inundate approximately 166 acres of *Phragmites* marsh.

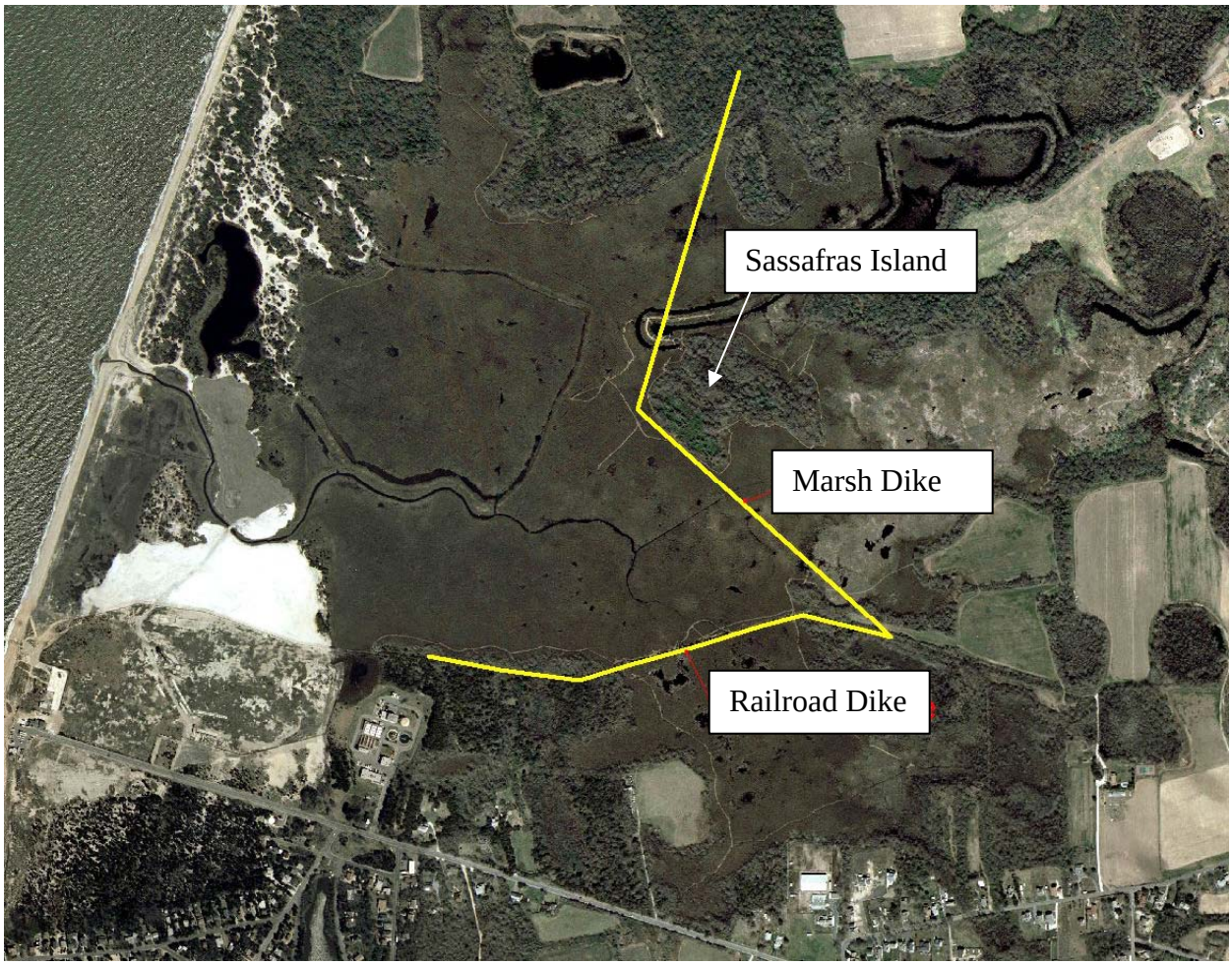

Figure 3. Full tidal inundation using earthen berms.

The proposed dike would start at uplands to the north of the marsh and cut across to Sassafras Island, from the island the dike would continue southward and tie-in to the abandoned railroad berm located in the southern portion of the site. The original plan was to use existing marsh material (soil) to construct the dike. Geotechnical borings were completed at the proposed location and the on-site material was deemed not suitable for dike construction. Hence, the material would have to be trucked in from elsewhere and this added considerably to the cost. In addition, existing marsh areas would be potentially impacted during the

construction of the dike. Due to the prohibitively high cost (the need to bring in large volumes of suitable fill and necessary preparation of the foundation) and environmental impacts, this alternative was not considered viable.

4.5 Invasive Species Control – Tidal Flooding - tidal inundation with water-control structure

An existing condition hydraulic analysis showed that the existing channel is inadequate to the task of delivering large quantities of saltwater to the marsh during daily tide conditions. An enlarged channel from the bay to the marsh is needed to inundate the marsh with saltwater. A range of channels were analyzed to determine the approximate size of the new channel necessary to adequately inundate the marsh. The smallest channel analyzed had a bottom width of 20 ft and a bottom elevation of -4.0 ft (minimal excavation). The largest channel analyzed had a bottom width of 50 ft and a bottom elevation of -6.0 ft.

However, any new channel excavated to ensure daily tidal inundation of the marsh is capable of flooding the interior through the delivery of large volumes of water during storm tides. Table 1 show the results of the hydraulic model runs for various storm tides for the various channels. Examination of Table 1 leads one to conclude that construction of a channel large enough to inundate the marsh during a normal tide signal is large enough to flood the surrounding land during storm tide. A means is required to protect the surrounding property.

Table 1
Summary of Various Channel Widths and Delaware Bay Storms

Channel Plan	Storm Events			
	2yr	10yr	100yr	500yr
	Existing Interior Water Surface Elevations (ft-NAVD)			
	1.47	1.66	4.35	9.3
Bottom Width = 50ft ELMIN= -6 (ft-NAVD)	3.57	4.87	7.57	9.28
Bottom Width = 20ft ELMIN= -6 (ft-NAVD)	3.38	4.71	7.41	9.14
Bottom Width=10 ft ELMIN= -6 (ft-NAVD)	3.21	4.48	7.18	9.07
Bottom Width = 20 ft ELMIN= -4 (ft-NAVD)	3.13	4.33	7.19	9.3
Existing Channel with Culvert removed	1.93	2.87	-	-

A water control structure was the selected method of protection and a plan of improvement was designed to provide maximum daily inundation of the north marsh while minimizing interior water levels due to Delaware Bay storms. The proposed crest elevation of the hydraulic structure is specified as elevation 10.6 ft. This is 1.3 ft higher than the 500 year water surface elevation (wsel) and 3 ft higher than the 100 year water surface elevation. Elevation 10.6 is slightly lower than the elevation of the dunes fronting the bay. The hydraulic structure and approach channel from the bay were sized to attenuate bay tides.

The north marsh encompasses approximately 270 acres. The elevations of the north marsh vary from 1.3 to

1.5 ft with the majority of the elevations around 1.3. The design provides for a volume of salt water capable of inundating 270 acres of marsh (at elevation 1.3). Due to minor differences in topography, some areas of the marsh may not be inundated while other areas may be inundated to a depth greater than the average depth of inundation. The average depth of inundation is the maximum wsel minus the average marsh elevation of 1.3 ft. The north marsh will need to be extensively ditched in order to deliver saltwater to its far reaches.

Two locations were considered for the hydraulic structure: at the marsh end of the existing channel and through the north spoil pile. The two locations are shown in Figure 4 and Figure 5.

4.5.1 Tidal inundation with water-control structure (existing channel)

This alternative involves enlarging the existing creek channel over a length of 1600 feet to a bottom width of 20 feet and lowering the bottom elevation from -2 ft to -6 ft to increase the volume of water entering the marsh. This alternative also involves the construction of a water control structure at the junction of the existing channel with the marsh (Figure 4). The water control structure would be approximately 17 ft high and 40 ft wide, with the adjacent sheetpiling over 200 ft wide. In addition to enlarging the inlet channel, new interior ditches will be required to provide daily tidal inundation into the north marsh. This alternative would inundate approximately 270 acres of *Phragmites* marsh.

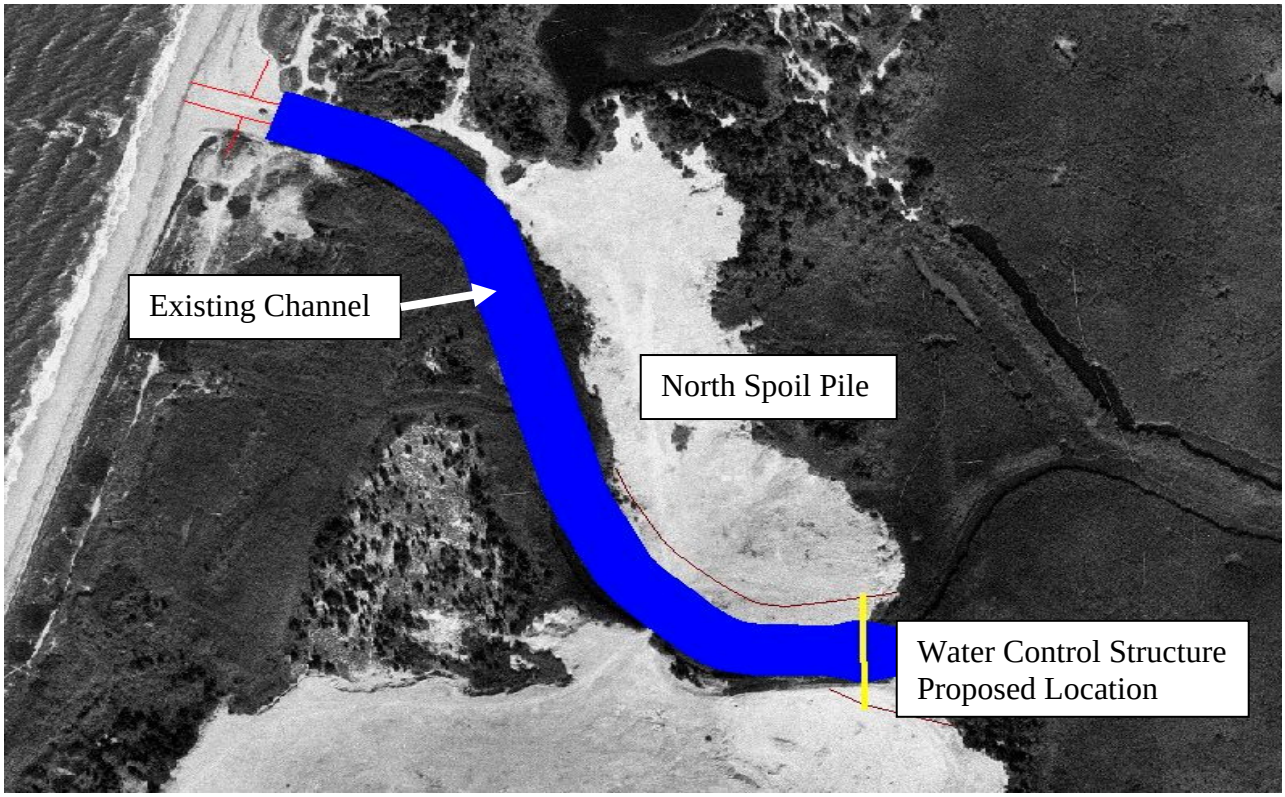

Figure 4. Tidal inundation with water-control structure (existing channel).

The proposed structure would be composed of 4 box culverts with gates on each to control the amount of water entering the marsh. The water-control structure would protect local residents from Delaware Bay storms up to the 500-year level, but would allow daily inundation of approximately 270 acres of *Phragmites* salt marsh. This alternative would use the existing alignment, which would be approximately 1650 ft from Delaware Bay to the constructed water-control structure. In addition, a new jetty will be constructed at the

bay inlet area to prevent sedimentation of the new inlet.

The potential of breaching the existing dunes near the current inlet is a concern with this alternative. If these northern dunes breach, the new water control structure will be flanked and the residents will have limited protection from Delaware Bay storms. Due to the erosion concerns of the north dunes and the winding nature of the existing channel alignment, this alternative was not selected.

4.5.2 Preferred alternative - Tidal inundation with water-control structure (new channel alignment)

This alternative creates a new 920-foot-long channel with a bottom width of 20 feet and lowers the channel elevation from 1 ft to -6 ft to increase the volume of water entering the marsh. The proposed channel length would be approximately 920 ft from Delaware Bay to the constructed water-control structure and would be consistent with the previous historical location of Pond Creek. The water control structure would be located in the middle of the north spoil pile and would be approximately 17 ft high and 40 ft wide (Figure 5). In addition, the sheetpiling adjacent to the water control structure would be 200 ft wide. The proposed structure would be composed of 4 box culverts with gates on each to control the amount of water entering the marsh (see Appendix F to review details of the 30% design). The water-control structure would protect local residents from Delaware Bay storms up to the 500-year level, but would allow daily inundation of approximately 270 acres of *Phragmites* salt marsh.

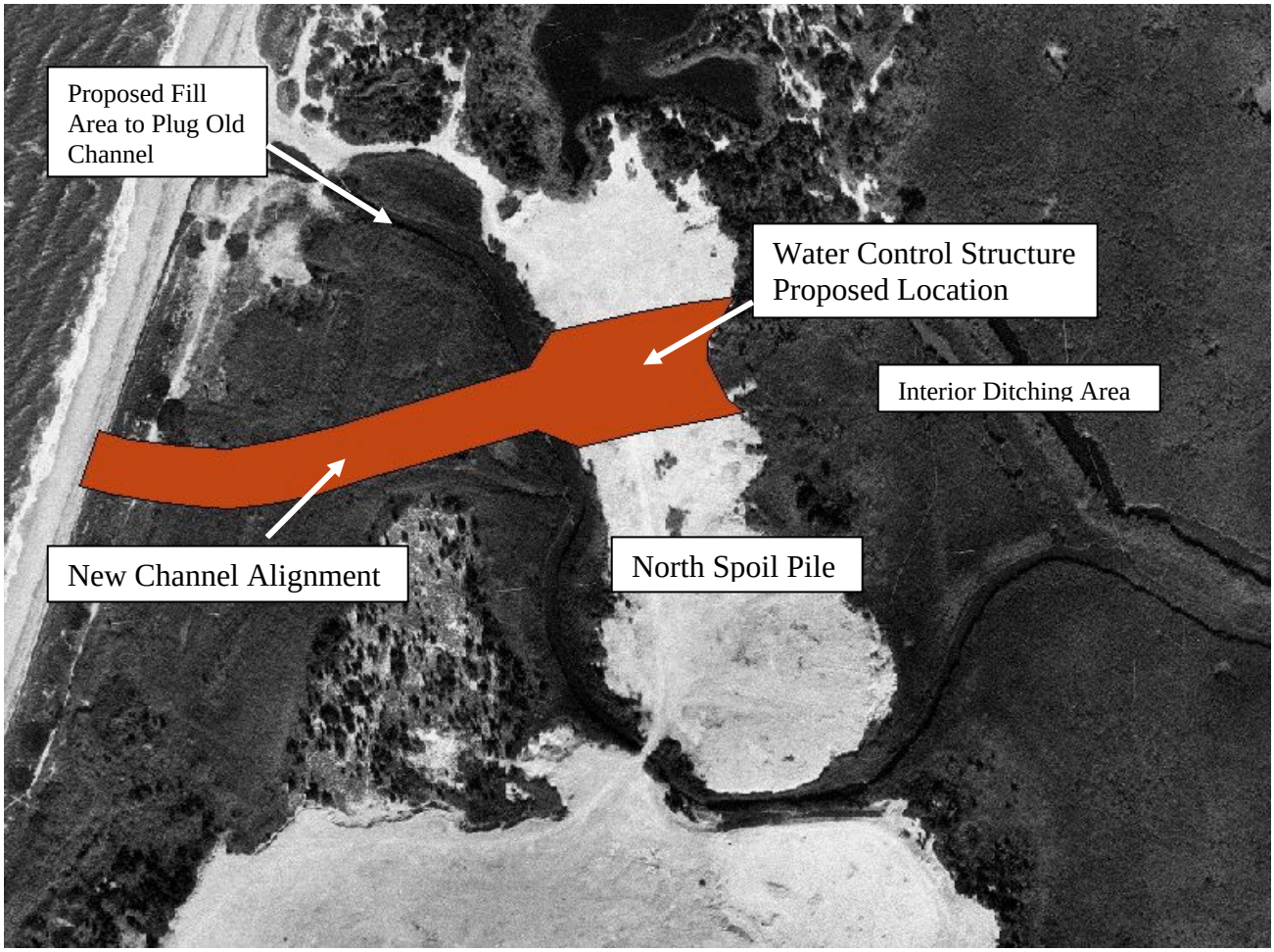

Figure 5. Preferred alternative: tidal inundation with water-control structure (new channel alignment).

This alternative requires excavation through an existing spoil pile deposited by a previous property owner. The excavated sand from behind the dunes will be used to plug the current channel opening. Material excavated for the new channel within the spoil pile will be placed on the adjacent areas of the spoil pile and reseeded. Approximately 26,000 cubic yards (cys) will be excavated within the spoil pile and approximately 13,000 cys will be excavated outside the spoil pile for the new channel. Additionally, a new jetty (Appendix E) will be constructed to stabilize the new inlet for the channel. In order to daylight the channel to the required bottom elevation, the new channel will go 154 ft. into Delaware Bay. This portion of the new channel (approx. 2400 cys) will be dredged and the material placed on the beach.

In addition to enlarging the inlet channel, new interior ditches will be required to provide daily tidal inundation into the north marsh. The following provides estimated dimensions of interior ditching required to adequately inundate the north marsh:

Main Channel 1: 10 ft bottom width,
2400 ft long; side slopes of 1V to 5H; elmin = -3.3 ft

Laterals:
24 laterals, 12 on each side of the main channel.
5 ft bottom width
1500 ft long; side slopes of 1V to 5H; elmin = -3.3 ft

Main Channel 2:
(up north finger) 10 ft bottom width
2800 ft long; side slopes of 1V to 5H; elmin = -3.3 ft

Laterals: 28 laterals, 14 on each side of the main channel
5 ft bottom width
200 ft long; side slopes of 1V to 5H; elmin = -3.3 ft

Main Channel 3:
(up south finger) 10 ft bottom width
2800 ft long; side slopes of 1V to 5H; elmin = -3.3 ft

Laterals: 28 laterals, 14 on each side of the main channel
5 ft bottom width
400 ft long; side slopes of 1V to 5H; elmin = -3.3 ft

Ditching would create channels approximately 200 ft apart. This ditching is necessary to properly move the water through the marsh and flood the existing *Phragmites*. Additional ditching information can be found in the Appendix D.

Selection of the preferred plan is based on performance and stability. The plan also seeks to minimize costs associated with excavation of the new channel and negative impacts to the environment during construction. In order to prevent interior flooding during storm events, the water control structure can not be bypassed and the dunes north of the existing inlet must not be breached. The existing dunes are substantial and are unlikely to fail during storm events. However, long-term erosion is possible due to inlet processes

specifically during the formation of the ebb and flood shoals. Eventually equilibrium will be reached and bypassing and re-attachment bars established, but until that happens there will be an interruption of the littoral drift that may trigger down drift erosion. To counter this affect, the selected plan places the inlet south of the existing inlet (approximately 600 ft south). If down drift erosion is triggered and equilibrium is not quickly reestablished, there will be time to mobilize and augment the beach with sand before the Davy's Lake dunes are affected. (Dunes between the last groin in Cape May Point and the existing inlet can be breached without bypassing the proposed project.) The existing inlet has not always been in its present location. Figure 6 is an 1888 map showing the inlet 1500 feet south of the present location.

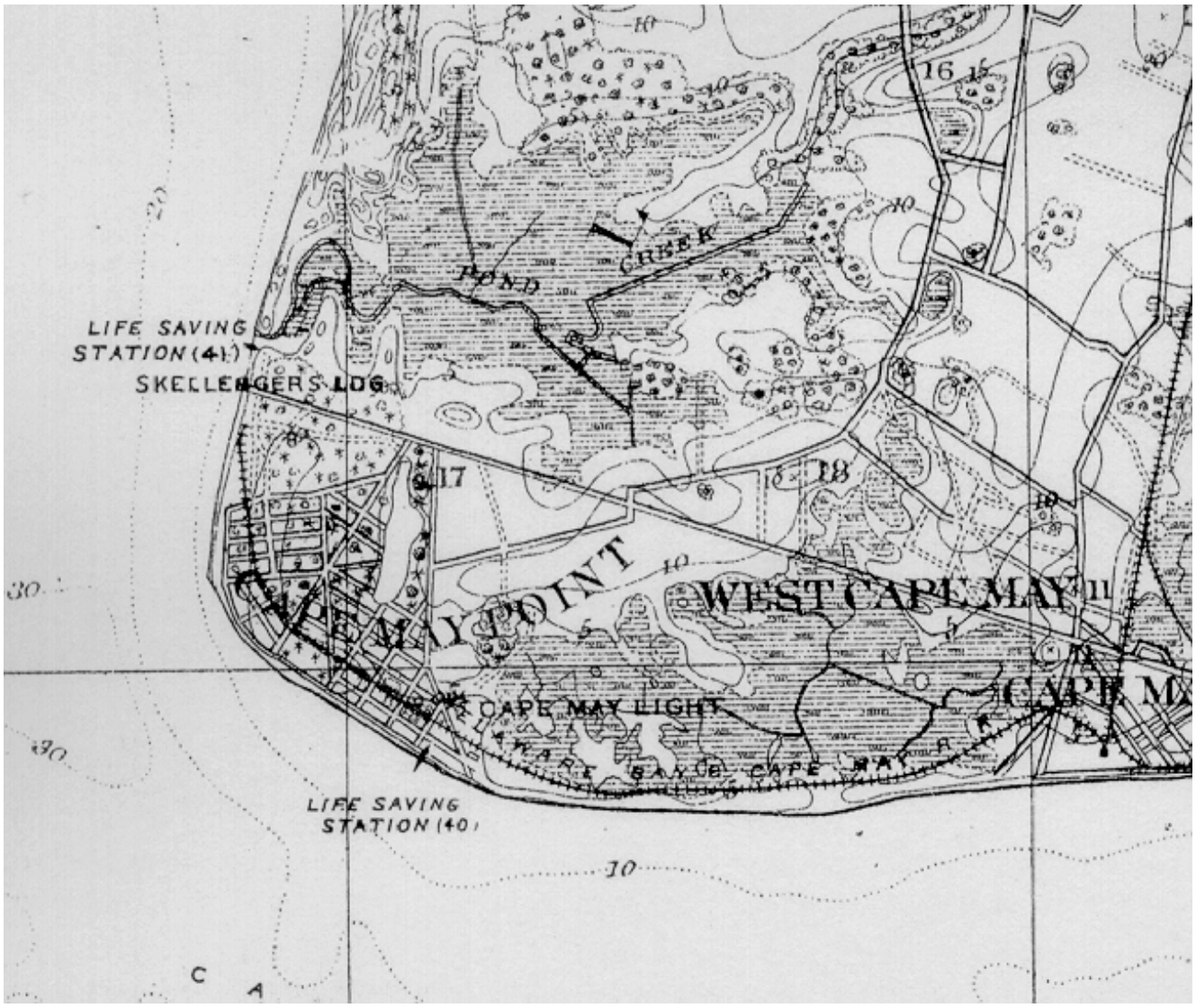

Figure 6. An 1888 map showing the original alignment of Pond Creek.

Current conditions at the site provide local residents with protection from Delaware Bay storms at the 20-year level. When completed, this proposed alternative will provide residents with Delaware Bay storm protection to the 500-year level. In addition, by moving the channel to the south of the existing inlet, the concerns over erosion of the north dunes are alleviated. By having the inlet in this location, the water control structure is protected, by existing dunes that will be located on either side of the new channel, from future erosion. Due to the environmental and hydraulic reasons, this is the preferred and selected alternative.

Table 2. Incremental Cost Comparison of Alternatives for the Pond Creek Salt Marsh Restoration Project.

Alternative	Potential Issues / Support	Estimated Cost	Benefits	Conclusion
No Action	Does not solve the problem.	$0	None	- Not recommended. - Would not achieve goal of restoring estuarine intertidal emergent wetland.
Invasive Species Control – Chemical (includes construction of new jetty to keep existing channel open)	- Environmental issues of spraying, similar to Corps Lower Cape May Meadow's project (public opposition). - Maintenance issue of multiple spray applications needed to eradicate *Phragmites*.	$1.3 million or $6,500 /acre	- Removal of *Phragmites* - Improved habitat - Approx. 200 acres restored.	- Not Recommended. - Lengthy time delay in seeing results. - Environmental and maintenance issues too great.
Invasive Species Control - Freshwater Flooding	- Flooding from rainwater to local residents due to loss of potential storage capacity. - Water control structure maintenance - Would not achieve goal of restoring estuarine intertidal emergent wetland.	$4.5 million or $27,000 /acre	- Improved freshwater marsh - Approx. 165 acres improved.	- Not recommended. - Dikes would result in impacts/loss of wetlands. - Would not achieve project goal.
Invasive Species Control – Tidal Flooding with Constructed Dike	- Cost of dike material - Unable to control volume of water entering the marsh. - Dike maintenance	$3.7 million or $22,424 /acre	- Restored estuarine intertidal wetland - Removal of *Phragmites* - Approx. 165 acres restored.	- Not recommended. - Dikes would result in impacts/loss of wetlands.
Invasive Species Control – Tidal Flooding with Water Control Structure	- Can regulate amount of water entering marsh. - Non-federal sponsor's preferred plan. - Supported by resource agencies. - Water control structure. maintenance	$2.9 million or $11,000 /acre	- Restored estuarine intertidal wetland. - Removal of *Phragmites* - Approx. 270 acres restored.	**Recommended**

5.0 Existing Conditions

Prior to 1917, Pond Creek was a free flowing tidal creek, inundated daily by tidal waters of the Delaware Bay. In 1917, a tide gate was installed by the Cape May County Mosquito Extermination Commission to maintain fresh water in Pond Creek. Since that time, the outlet failed numerous times due to the beach building process as sand transported by littoral drift plugged the sluice. This continues to be a problem, causing flooding of adjacent agricultural and residential areas due to inefficient movement of freshwater out of Pond Creek. The tide gate has since deteriorated and been removed. In addition, in the 1950s and 1960s, common reed began to invade Pond Creek. Currently, approximately 95 to 100 percent of the lower Pond Creek marsh is covered by common reed. By 1978, the State of New Jersey purchased the majority of Pond Creek for the Higbee Beach Wildlife Management Area for the benefit of fish and wildlife resources. The Higbee Beach Wildlife Management Plan (Kell *et al*., 1983) identifies two management alternatives which include total tidal inundation of Pond Creek or partial tidal inundation of Pond Creek. The proposed project satisfies the partial tidal inundation alternative.

The Pond Creek marsh, once a free-flowing estuarine tidal marsh before human disturbance, is part of the State of New Jersey's Higbee Beach Wildlife Management Area. The State's Division of Fish and Wildlife currently manages the marsh for migratory bird and waterfowl habitat and human recreation (e.g., bird watching, hunting, and other forms of passive and active recreation). The marsh is bordered by vegetated dunes [beach grass (*Ammophila breviligulata*)] to the west and abandoned railroad tracks supporting red cedar (*Juniperus virginiana*), northern bayberry (*Myrica pensylvanica*), and wax myrtle (*Myrica cerifera*) to the south. A portion of Pond Creek marsh extends south of the abandoned railroad tracks and is bordered by agricultural land, residential development, and small patches of upland forest. The eastern portion of Pond Creek is bordered by agricultural lands with upland forest buffers. The northern portion of Pond Creek is bordered primarily by upland forest with several agricultural fields. An upland forested island is situated in the middle of the Pond Creek marsh, known as Sassafras Island. A small open freshwater area identified as Davey's Lake is situated northwest of the marsh. Land use surrounding Pond Creek continues to be dominated by agricultural activities (i.e., horse farms, small crop fields, pasture) and limited residential development.

5.1 Vegetation and Soils

Currently, the western portion of the site is an undeveloped coastal beach and dune complex. The beach is bordered to the west by the Delaware Bay and to the east by primary dunes ranging in height from 8 to 15 feet. The dunes support American beach grass (*Ammophila breviligulata*), coastal panic grass (*Panicum amarum*), seaside goldenrod (*Solidago sempervirens*), bayberry (*Myrica pensylvanica*), rugose rose (*Rosa rugosa*), poison ivy (*Toxicodendron radicans*), among other plants. Dune and beach substrate is sand providing a low-fertility, excessively drained soil.

Approximately 4.5 acres of the southern portion of the site is dominated by a disposal site associated with the Harbison Walker magnesite plant. This plant, operating from 1941 to 1983, placed processed waste (primarily consisting of waste magnesite and spent or un-reacted dolomite with a high calcium and magnesium content) on the marsh. The deposition material is extremely basic (high pH) and as such limits vegetative growth. The majority of the deposition site remains barren, although efforts of the last two years of placing and disking in dredged material have been successful at neutralizing the pH and initiating vegetative growth (mostly grasses).

Tidal marsh makes up the majority of the project site (over 270 acres). The substrate in the wetlands is a deep layer of muck with layers of soft silt loam and organic material. According to the Cape May County soil survey, the muck substrate ranges from 1 foot to more than 10 feet thick with high organic matter and anaerobic conditions. The majority of the vegetation within the marsh is made up of *Phragmites*. No other plants were identified within the lower portion of Pond Creek west of Sassafras Island. Wetland areas east of Sassafras Island transition from *Phragmites* dominated wetlands to mixed forested wetlands dominated by conifers; deciduous forested wetlands, and deciduous scrub/shrub wetlands. There are a few areas east of Sassafras Island that remain palustrine emergent wetlands with no *Phragmites*.

5.2 Wetlands

Wetlands within the project area are classified as both Service "priority wetlands" and North American Waterfowl Management Plan (NAWMP) "focus areas." The Emergency Wetlands Resources Act of 1986 (P.L. 99-645) directs the Department of the Interior to identify the location and types of wetlands that should receive priority attention for acquisition by federal and State agencies using Land and Water Conservation Fund appropriations. "Focus areas" are defined by the Atlantic Coast Venture of the NAWMP as sites containing critical waterfowl wintering, migratory, or breeding habitat, with an emphasis placed on American Black Duck (*Anas rubripes*) habitat and are areas identified as requiring protection. Restoration of the Pond Creek wetlands will restore a variety of functions and values to these wetlands including the ability to provide valuable fish and wildlife habitat.

5.3 Fishery Resources

The Pond Creek wetlands currently provide little to no fisheries value due to the restriction of tidal water and the extensive colonization of common reed within the wetlands. The limited fish species that do exist (e.g., Atlantic silversides (*Menidia menidia*)) are restricted to the current channel inlet to Pond Creek.

Essential Fish Habitat

Under provisions of the Magnuson-Stevens Act, areas along the Atlantic coast, including the proposed project area are designated as Essential Fish Habitat (EFH) for species with Fishery Management Plans (FMP's). The NMFS has identified EFH within 10' X 10' square coordinates. The study area contains EFH for various life stages for eight species of managed fish. Table 2 presents the managed species and their life stage that EFH is identified in the Pond Creek / Delaware Bay area. The habitat requirements for the identified EFH species and their representative live stages are provided in Table 3.

Table 3. Summary of Essential Fish Habitat (EFH) Designation for Pond Creek / Delaware Bay Area (NMFS Website, 2005).

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod *(Gadus morhua)*				X
red hake *(Urophycis chuss)*	X	X	X	
winter flounder *(Pleuronectes americanus)*	X	X	X	X

windowpane flounder *(Scopthalmus aquosus)*	X	X	X	X
Atlantic sea herring *(Clupea harengus)*			X	X
monkfish *(Lophius americanus)*	X	X		
bluefish (*Pomatomus saltatrix*)			X	X
Atlantic butterfish *(Peprilus triacanthus)*		X	X	X
summer flounder *(Paralicthys dentatus)*		X	X	X
scup *(Stenotomus chrysops)*			X	X
black sea bass *(Centropristus striata)*			X	X
king mackerel *(Scomberomorus cavalla)*	X	X	X	X
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
cobia *(Rachycentron canadum)*	X	X	X	X
sand tiger shark *(Odontaspis taurus)*		X		X
Atlantic angel shark *(Squatina dumerili)*		X	X	X
Atl. sharpnose shark *(Rhizopriondon terraenovae)*				X
dusky shark *(Charcharinus obscurus)*		X		
sandbar shark *(Charcharinus plumbeus)*		X (HAPC)	X (HAPC)	X (HAPC)
scalloped hammerhead shark *(Sphyrna lewini)*			X	
tiger shark *(Galeocerdo cuvieri)*		X		

Table 4. Habitat Utilization of Identified EFH Species Identified in the Pond Creek / Delaware Bay Area (NMFS Website, 2005)

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic cod *(Gadus morhua)*				Bottom habitats Rocks, pebbles, gravel Temps <10 C 29-34% salinity 10-150 m depth
red hake *(Urophycis chuss)*	Surface waters of inner continental shelf, peaks in June and July. Temps <10 C <25% salinity	Surface waters, peaks in Sept and Oct. Temps <19 C >0.5% salinity <200 m depth	Bottom habitats with shell fragments Temps <16 C 31-33% salinity <100 m depth	
winter flounder *(Pleuronectes americanus)*	Bottom habitats (muddy sand, sand, gravel), February to June. Temps <10 C 10-30% salinity <5 m depth	Pelagic and bottom waters, March to July. Temps <15 C 4-30% salinity <6 m depth	Bottom habitats (mud or fine grained sand) Temps <25 C 10-30% salinity 1-50 m depth	Bottom habitats (mud, sand, gravel) Temps <25 C 15-33% salinity 1-75 m depth
windowpane flounder *(Scopthalmus aquosus)*	Surface waters, peaks May and Oct Temps <20 C <70 m depth	Pelagic waters, peaks May and Oct Temps <20C <70 m depth	Bottom habitats (mud or fine grained sand) Temps <25 C 5.5-36% salinity 1-100 m depth	Bottom habitats (mud or fine grained sand) Temps <26.8 C 5.5-36% salinity 1-100 m depth
Atlantic sea herring *(Clupea harengus)*			Pelagic waters and bottom habitats Temps <10 C 26-32% salinity 15-135 m depth	Pelagic waters and bottom habitats Temps <10 C >28% salinity 20-130 m depth
monkfish *(Lophius americanus)*	Surface waters, March to Sept Temps <18 C 15-1000 m depth	Pelagic waters, peaks March to Sept Temps 15 C 25-1000 m depth		
bluefish *(Pomatomus saltatrix)*			Pelagic waters, Mid-Atlantic estuaries May to Oct Temps 19-24 C 23-36% salinity	Pelagic waters, Mid-Atlantic estuaries April to Oct Temps 14-16 C >25% salinity
Atlantic butterfish *(Peprilus triacanthus)*		Estuaries, May – Sept. Temps 7-26 C 3-37% salinity 1-1750 m depth (most <120)	Pelagic waters, estuaries spring to fall Temps 3-28 C 3-37% salinity 1-365 m depth (most <120)	Pelagic waters, estuaries summer to fall Temps 3-28 C 4-26% salinity 10-365 m depth (most <120)
summer flounder *(Paralicthys dentatus)*		Pelagic waters, peaks May and Oct Temps 9-12 C 23-33% salinity 10-70 m depth	Demersal waters (mud, but prefers sand) Temps >11 C 10-30% salinity 0.5-5 m depth	Demersal waters and estuaries 0-25 m depth

Table 4. Habitat Utilization of Identified EFH Species Identified in the Pond Creek / Delaware Bay Area (NMFS Website, 2005)

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
scup *(Stenotomus chrysops)*			Demersal waters, spring and summer in estuaries and bays Temps >7 C >15% salinity 0-38 m depth	Demersal waters and inshore estuaries Temps >7 C >15% salinity 2-185 m depth
black sea bass *(Centropristus striata)*			Estuaries in spring and summer; rough bottom, shellfish, and eelgrass beds Temps >6 C >18% salinity 1-38 m depth	Inshore estuaries from May to Oct; structured habitat sand and shell substrates preferred Temps >6 C >20% salinity 20-50 m depth
king mackerel *(Scomberomorus cavalla)*	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity
Spanish mackerel *(Scomberomorus maculatus)*	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity
cobia *(Rachycentron canadum)*	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity
sand tiger shark *(Odontaspis taurus)*		Shallow coastal waters <25 m depth		Shallow coastal waters <25 m depth
Atlantic angel shark *(Squatina dumerili)*		Shallow coastal waters <25 m depth	Shallow coastal waters <25 m depth	Shallow coastal waters <25 m depth
Atl. sharpnose shark *(Rhizoprionodon terraenovae)*				Shallow coastal waters <25 m depth
dusky shark *(Charcharinus obscurus)*		Shallow coastal waters, inlets, and estuaries <25 m depth		
sandbar shark *(Charcharinus plumbeus)*		Shallow coastal waters <25 m depth	Shallow coastal waters <25 m depth	Shallow coastal waters <50 m depth
scalloped hammerhead shark *(Sphyrna lewini)*			Shallow coastal waters <200 m depth	
tiger shark *(Galeocerdo cuvieri)*		Shallow coastal waters <200 m depth		

5.4 Wildlife Resources

The lower Cape May Peninsula is one of the most important migratory concentration areas in the world (Kerlinger, 1991; Mabey, 1992). The migratory bird community that uses the lower Cape May Peninsula includes 130 species of neotropical migrants, 20 species of waterfowl, American woodcock, 16 species of raptors, 4 species of owls, and many species of short-distance migrants. One of the primary reasons the Cape May Peninsula is critical to migratory birds is that the peninsula terminates at one of the longest overwater crossings on the east coast. Migratory birds stop over at the peninsula to improve their physical condition via increased body-fat content and / or wait for favorable flight conditions.

The surrounding beach, dune, and estuarine wetlands provide high quality habitat for a variety of migratory shorebirds. Shorebirds that use the beaches and associated estuarine wetlands on and in the vicinity of Pond Creek include: ruddy turnstone (*Arenaria interpres*), willet (*Catoptrophorus semipalmatus*), red knot, dunlin (*Calidris alpina*), semipalmated sandpiper (*C. pusilla*), short-billed dowitcher (*Limnodromus griseus*), sanderling (*Calidris alba*), and least sandpiper (*Calidris minutilla*) (New Jersey Division of Fish and Wildlife, 1994).

A variety of colonial waterbirds nest within approximately 3 miles of Pond Creek including: little blue heron (*Egretta caerulea*), tricolored heron (*E. tricolor*), snowy egret (*E. thula*), black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night heron (*N. violaceus*), great egret (*Casmerodius albus*), cattle egret (*Bubulcus ibis*), and the glossy ibis (*Plegadis falcinellus*) (Andrews, 1985). Common tern (*Sterna hirundo*), and black skimmers (*Rynchops niger*) also nest in the vicinity of Pond Creek.

The Cape May Peninsula also provides important resting and feeding areas for migratory waterfowl on the Atlantic flyway. Undeveloped coastal estuarine wetlands and the adjacent uplands provide habitat for American black duck (*Anas rubripes*), mallard (*Anas platyrhynchos*), American widgeon (*A. americana*), green-winged teal (*A. crecca*), blue-winged teal (*A. discors*), greater scaup (*Aythya marila*), common goldeneye (*Bucephala clangula*), bufflehead (*B. albeola*), ruddy duck (*Oxyura jamaicensis*), hooded merganser (*Lophodytes cucullatus*), and brant *(Branta bernicla*) (New Jersey Division of Fish and Wildlife, 1994).

Southern Cape May County is considered by many as North America's premier birding area, particularly during southbound migration. No other area in North America can be found that provides foraging and loafing habitat to higher concentrations of raptors, such as osprey (*Pandion haliaetus*), peregrine falcons (*Falco peregrinus*), merlins (*Falco columbarius*), cooper hawks (*Accipiter cooperii*) and sharp-shinned hawks (*Accipiter striatus*) during that season. The lower Cape May Peninsula is one of the most important migratory concentration areas in the world (Kerlinger, 1991; Mabey, 1992).

Mammals common to the Pond Creek area include white-tailed deer (*Odocoileus virginianus*), eastern cottontail rabbit (*Sylvilagus floridanus*), and gray squirrel (*Sciurus carolinensis*). Other abundant, though illusive, species are the Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), red fox (*Vulpes vulpes*), muskrat (*Ondatra zibethica*), and raccoon (*Procyon lotor*).

The Pond Creek project area supports a variety of habitat types including beach, dune, palustrine emergent wetlands, ponds, and surrounding uplands. Most of these habitats provide valuable wildlife habitat and are ecologically sound. However, the emergent wetlands within Pond Creek provide limited wildlife value due to the predominance of *Phragmites*. Some wildlife continues to use the site including marsh wren (*Cistothorus palustris*) and red-winged blackbird (*Agelaius phoeniceus*); however the monoculture of *Phragmites* throughout the site severely limits habitat diversity and value.

5.5 Air and Water Quality

The air quality within Cumberland County and Atlantic County (both adjacent to Cape May County) has met (been below) the U.S. Environmental Protection Agency's (EPA) air quality standard for the past six years (Environmental Protection Agency, 2004), except for ozone, which has exceeded (failed to meet) EPA standards every year based on the 8-hour average.

Pond Creek watershed is approximately 1,695 acres or 2.6 square miles immediately south of the Cape May Canal (Schmid, 1972). Dissolved oxygen (DO) measured at a United States Geological Survey (USGS) sampling station at Higbee Beach between 1985 and 1992 averaged 0.1 mg/L (USGS, 2004). The median pH, during the same time period, was 7.9 (Range: 7.8 and 8.0 pH). It is likely that the pH level within the water is affected by waste magnesite associated with the Harbison and Walker spoil piles, as the spent or un-reacted dolomite with a high calcium and magnesium content is basic. In 1985 ammonia and nitrites were reported as 1.1 mg/L and 0.04 mg/L respectively. During the same period average phosphorous concentrations were 0.19 mg/L.

The Cape May peninsula is part of New Jersey's outer coastal plain. The substrate is underlain with unconsolidated sediments consisting of alternating beds of sand, silt, and clay. The Kirkwood-Cohansey aquifer system beneath Pond Creek is comprised of alluvial deposits and beach sand and gravel. The surface aquifer is the unconfined Holly Beach water-bearing zone. These two units make up the Cape May Formation. Beneath the Cape May Formation is a layer of silt and clay, then the estuarine sand aquifer, then another confining unit of silty clay, and then the Cohansey aquifer (Lacombe and Carleton, 2002). Most of the residential homes in the area rely on groundwater wells to provide water.

5.6 Threatened and Endangered Species

According to the Service, Higbee Beach and the Delaware Bay shoreline adjacent to Pond Creek provide habitat for the piping plover (*Charadrius melodus*). The piping plover is a federally threatened species that nests and forages on beaches during the spring and summer. No piping plovers have nested within the area in the last 5 years.

Swamp pink (*Helonias bullata*), a federally threatened species, occurs approximately 2.8 miles north of the project area; however no swamp pink habitat occurs in the project area. The federally listed threatened bald eagle (*Haliaeetus leucocephalus*) is a transient visitor of the project area and may forage in open water areas near the project area.

Several birds-of-prey occur in the vicinity of the project area including the State-listed (endangered) northern harrier (*Circus cyaneus*) and short-eared owl (*Asio flammeus*), and the State-listed (threatened) osprey (*Pandion haliaetus*) (New Jersey Division of Fish and Wildlife, 1994). The State-listed (threatened) black rail (*Laterallus jamaicensis*) also inhabits the salt and brackish marshes in the vicinity of Pond Creek (New Jersey Division of Fish and Wildlife, 1994).

5.7 Hydraulics and Hydrology

The Pond Creek watershed is shown in Figure 7. The marsh area, divided into two sections north and south of the abandoned railroad tracks is also shown on Figure 7. Pertinent drainage areas are provided in Table 4.

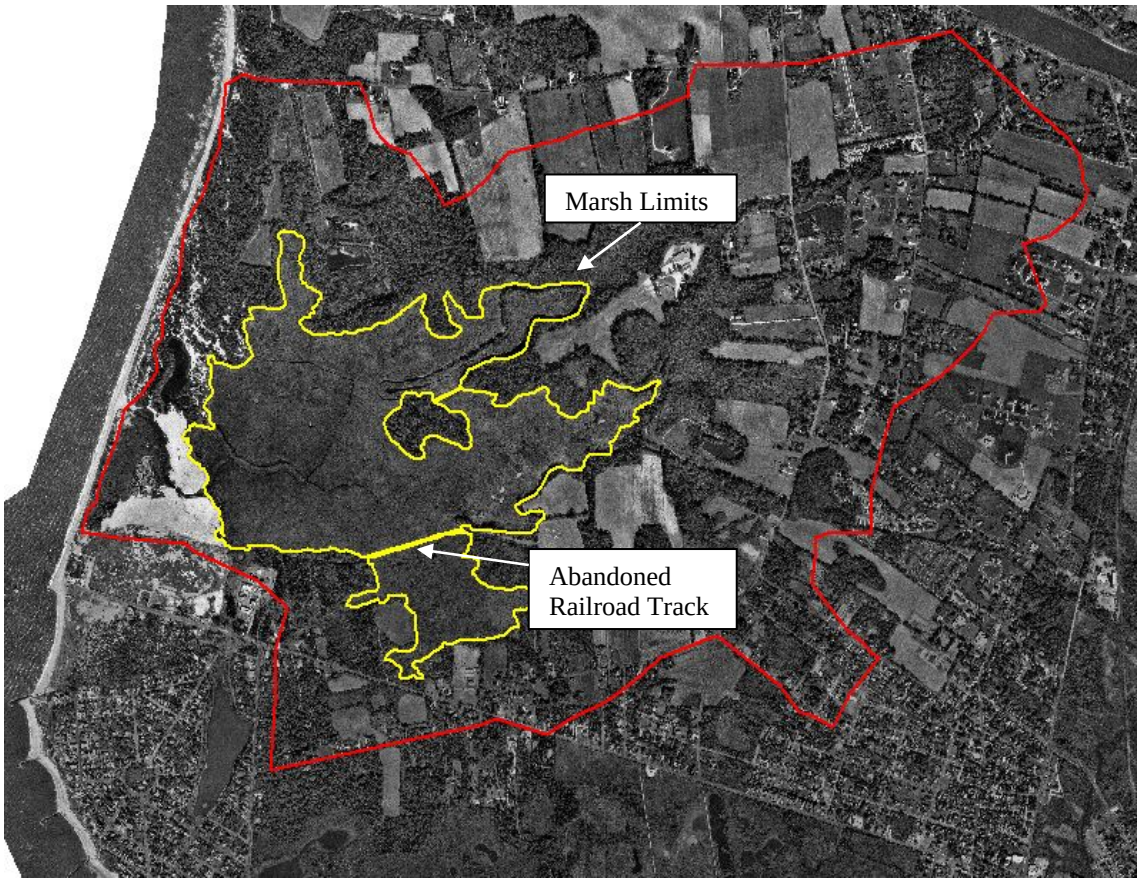

Figure 7. Pond Creek watershed and marsh limits.

Table 5 Pertinent Surface Areas of Pond Creek	
Item	Area (acres)
Drainage area at mouth	1624 *
Total Area of North Marsh	270
South Marsh U/S Of RR	42

*USGS reports Drainage Area of 1523 acres.

Hydraulic Modeling

The hydraulics of the existing condition were determined with the UNET model. UNET is a one dimensional unsteady state model that routes the tide signal from the Bay through the channel (accounting for the culvert constrictions) and calculates the volume of salt water delivered to the marsh. The volume is then coupled with an elevation-capacity curve to determine the water surface elevations in the marsh. UNET requires a downstream boundary condition which is either the astronomical tide stage hydrograph or a storm frequency stage hydrograph. UNET also requires survey data that reflects the flow capacity of the channel from the

bay and the storage capacity of the marsh. UNET was run for the existing condition and all proposed plans of improvement.

Tide Data

Astronomical tide level data is provided in Table 5 and storm frequency data is provided in Table 6.

Table 6 Tide Data for Pond Creek	
Item	Water Surface Elevation (Feet NAVD88)
Mean Lower Low Water	-3.27
Mean Low Water	-3.11
Mean Tide Level	-0.65
Mean High Water	1.80
Mean Higher High Water	2.20

Table 7 Delaware Bay Storm Frequency Water Surface Elevations	
Event (year)	Water Surface Elevation (Feet NAVD88)
2	3.6
5	4.0
10	4.9
20	5.7
50	6.9
100	7.6
200	8.3
500	9.3

Survey Data

A large number of surveyed spot elevations were obtained for use in defining the hydraulic geometry of the UNET model. Numerous points were surveyed in the vicinity of the spoil piles to define the channel and over-bank geometry. Spot elevations were taken at the edge of the marsh and around the perimeter to define the elevation of the marsh relative to the tide signal and to define its storage capacity. Spot elevations were also taken of the developed property surrounding the marsh. The surface area of the north marsh is 270 acres and the spot elevations range from 1.1 to 1.5 ft with an average of 1.3 ft. The surface area of the south marsh is 42 acres and spot elevations range from 1.3 to 1.7 ft, but the majority of the elevations are 1.7 ft.

Subsequent to the survey (January 2002) NJDEP raised the north spoil pile by approximately 7 feet with dredged material removed from the Cape May Canal disposal site. The fill was placed only on the north

spoil pile so those elevations have changed since our initial survey. NJDEP will provide a detailed survey of the filled area at the completion of filling operations.

5.8 Socioeconomics

The New Jersey Division of Fish and Wildlife has a very active program in trying to encourage the public to use State game lands for a variety of recreational uses including: bird watching, photography, hiking, fishing, and hunting, as long as such activities do not conflict with wildlife management objectives. In addition, the New Jersey Division of Fish and Wildlife, Endangered and Nongame Species Program, in cooperation with the New Jersey Audubon Society through the Cape May Stopover Protection Project, conducted three workshops and produced pamphlets regarding construction of butterfly and hummingbird gardens, wildflower meadows, ponds, and backyard habitat for wildlife.

Cape May is a premier resort for vacation travelers throughout the Northeast. Tourism is one of the major components of the local economy. In 1988 alone, bird-watching tourism in Cape May contributed over $5.5 million to the local economy by 90,000 bird-watching travelers (Kerlinger and Weidner, 1991). Additional bird-watching venues such as the Pond Creek restoration project will assist in driving the local economy. Tidal inundation and the subsequent biological control of mosquitoes will help minimize mosquito breeding habitat and minimize chemical control of mosquito larvae, which will also indirectly help tourism in Cape May.

5.9 Historic and Cultural Resources

The first records of land ownership at Pond Creek date back to 1741 when John Stillwell acquired approximately 200 acres on the Delaware Bay between Pond Creek and New England Creek. The Stillwell property was inherited for several generations. In the early 1900's Pond Creek was large and deep enough for some sailing vessels and was used for delivery of lumber, salt marsh hay, sand, and produce (New Jersey Division of Fish and Wildlife, 1983). Also in the early 1900's a unidirectional tide gate was installed by salt hay farmers to assist in growing and harvesting salt hay. In 1917 a permanent tide gate was installed eventually converting Pond Creek from an estuarine wetland to a palustrine wetland. This tide gate was installed primarily for mosquito control. Commerce associated with Pond Creek ceased after 1917, except during a brief time during the Prohibition Era, during which Signal Hill (one of the tallest dunes in the area, adjacent to Davy's Lake) was used to guide rum runners ashore (Lomax, 1975). In 1923 the property was sold to John S. Higbee who operated a tavern, farm, and inn (Hermitage Hotel) in the area for many years. Between 1940 and present day the outlet, sluice, and tide gate were repaired and replaced at frequent intervals by the Mosquito Commission due to ice and storm damage (Lomax, 1975). Changes in ownership throughout the years did little to substantially change Pond Creek through the mid to late 1900's, except for operation of the Harbison Walker Magnesite Plant. Operation of this plant and its associated spoil pile filled over 5 acres of wetlands at Pond Creek and left a large unvegetated and barren area in Pond Creek. The tide gate has since deteriorated and been removed.

5.10 Land Use

From 1941 to 1983, Dresser Industries operated the Harbison Walker Magnesite Plant (sometimes called the Northwest Magnesite Plant). Operation of the plant consisted of reacting softened clarified seawater from the Delaware Bay with dolomite to produce a magnesium hydroxide solution. This solution was filtered and then fired in rotary kilns to produce magnesite refractory brick. The magnesite plant closed in 1983 and pursuant to the New Jersey Environmental Cleanup Responsibility Act (ECRA) was demolished and removed in 1984. The only remains of the plant are a 10-foot-high chain link fence surrounding the plant

site, a water tower, and a plant disposal area of process waste (primarily consisting of water, magnesite and spent or un-reacted dolomite with a high calcium and magnesium content). The State of New Jersey purchased the Harbison Walker Site in 1999 through its Green Acres Program and transferred it to the New Jersey Division of Fish and Wildlife as part of its Higbee Beach Wildlife Management Area. Land use within the Higbee Beach Wildlife Management Area is restricted to passive recreation, hunting, fishing, and bird-watching. Land use surrounding Pond Creek continues to be dominated by agricultural activities (i.e., horse farms, small crop fields, and pasture) and limited residential development.

6.0 Environmental Impacts

6.1 Vegetation and Soils

The preferred alternative involves excavating a new channel through a dune / beach complex to restore the original channel to Pond Creek as it existed prior to 1917. In addition, the project will involve construction within the deposition site and within the wetland areas. This alternative will involve the conversion of approximately 0.9 acres of beach / dune complex to a tidal channel with 1V:5H slopes (approximately 920 feet long and 125 feet wide). However the existing channel through the dunes (approximately 350 feet long and 150 feet wide) would be converted to a beach / dune complex of approximately 1.2 acres using material excavated from the new channel. As such, the preferred alternative has no net loss of beach / dune habitat. Soils will be stabilized on the access channel by using a 1V:5H slope and revegetating the banks with appropriate vegetation (e.g., dune grass and bayberry in dune habitat, and *Spartina alterniflora* in wetland areas). Rip-rap will be required for stabilization at the bottom of the new inlet jetty and at the base of water control structure (see Appendix F). All necessary soil erosion and sediment controls will be used during the construction to minimize impacts on Pond Creek wetlands and the Delaware Bay. Controls that would be implemented include the installation of soil erosion control fences to prevent runoff and debris from entering the creek. The contractor would be required to complete a plan that describes measures to prevent hazardous materials (e.g. oils) used during construction to enter the wetlands. Furthermore, all construction material would be disposed of in an appropriate manner.

Portions of the Harbison Walker spoil pile would be excavated. This material would be deposited on the other existing spoil piles currently on the project site. Material used from the excavation of tidal channels in wetland areas would also be placed on upland spoil piles and disked into the spoil pile to neutralize the pH within the spoil pile. These areas would then be replanted with native warm-season grasses and shrubs to revegetate the spoil piles thereby improving upland buffers adjacent to the Pond Creek wetlands.

6.2 Wetlands

The proposed project will restore approximately 270 acres of estuarine intertidal emergent wetlands through the reintroduction of tidal waters into wetlands that have been excluded from tidal water since 1917. Wetlands that are currently palustrine emergent wetlands within Pond Creek will be converted to estuarine wetlands. In addition, the invasive plant common reed will be replaced with beneficial estuarine species such as smooth cordgrass, salt hay grass, and spike grass. The remaining 147 acres of palustrine emergent and forested wetlands in the headwater areas of Pond Creek will be protected through the installation of the hydraulic structure limiting tidal flow in these areas.

Construction of the new channel and hydraulic structure associated with the preferred option will result in the excavation of approximately 1.2 acres of palustrine emergent wetlands that are currently dominated by common reed (*Phragmites*). These excavated wetlands will be converted to an estuarine open water channel to provide tidal water to the Pond Creek wetlands following the original watercourse as it existed prior to

1917. A side slope of 1V:5H will be constructed and portions of which would revert to estuarine emergent wetlands. The remaining portions of the excavated wetlands would revert to uplands along the upper edges of the channel. In addition, 0.5 acres of *Phragmites* marsh will be impacted by the temporary storage of excavated material from the channel until it is placed on the spoil pile or used to plug the old channel. Additional plant species that could be impacted by the excavation include: eastern red cedar (*Pinus Virginia*), bayberry (*Myrica Pensylvanica*), groundsel bush (*Baccharius halimifolia*), beach plum (*Prunus maritime*), red mulberry (*Morus rubra*), and winged sumac (*Rhus copallinum*) (Louis Berger 2000). A 0.10 acre area of palustrine open water at the current outlet of Pond Creek would be filled to plug the outlet and convert the area to coastal dune habitat. In addition, portions of the old channel will need to be plugged to prevent a hydraulic connection to the new channel. This would result in an additional fill of approximately 1.2 acres of open water.

The majority of the wetlands within Pond Creek are within Zone A as defined by the National Flood Insurance Program because they are subject to the 100-year flood event. The proposed project will not affect the flood zone category for the project area.

The proposed project would also involve minor and temporary impacts to wetlands associated with Open Marsh Water Management (OMWM). The OMWM process would involve installation of a variety of ponds and radials throughout the 270 acre marsh to provide refuge areas for mosquito-eating fish. These areas are created to allow these fish to move throughout the wetlands during high tide to consume mosquito larvae. The OMWM activities would comply with the Standards for OMWM (see Appendix A). In addition, new radial dispersion channels (see ditching plan in Section 4.5.2) will be created to direct tidal flow from the new water control structure into the *Phragmites* marsh.

6.3 Fishery Resources

The preferred option will open approximately 270 acres of estuarine emergent wetlands to a variety of estuarine-dependent fish that occur in the Delaware Bay including weakfish (*Cynoscion regalis*), Atlantic menhaden (*Brevoortia tyrannus*), bluefish (*Pomatomus saltatrix*), American eel (*Anguilla rostrata*), and white perch (*Morone americana*). The semi-anadromous striped bass (*Morone saxatilis*) could also occur within the lower portions of the Pond Creek wetlands. Perhaps most importantly the mummichog (*Fundulus heteroclitus*) would inhabit the Pond Creek wetlands providing an important forage base for predatory fish and wildlife, but also providing the primary control of mosquitoes within the wetlands. The proposed project would also open up additional foraging and possibly spawning areas for anadromous fish including blueback herring (*Alosa aestivalis*) and alewife (*Alosa pseudoharengus*). The construction of the new channel and inlet with jetty could have a temporary impact on fishery resources. Since finfish are mobile, most impacts will be avoided; however, some impacts to eggs and larvae may occur.

Essential Fish Habitat

Assessment: Based on the above listed habitat utilization by the designated EFH species, it appears that most of the species will not be found in the immediate project area, due to a depth requirement or the fact that they are very migratory in nature (i.e., the sharks). There is the potential for a few species to be found in the project area and these would include: winter flounder, windowpane flounder, summer flounder, king mackerel, Spanish mackerel, and cobia. Most of the above-listed fish species are not estuarine resident species and therefore only utilize this area on a seasonal basis, primarily in the warmer summer months. During the summer months the estuary is typically utilized as a forage area for juveniles and adults and nursery area for larvae and juveniles. The only apparent exception to this is winter flounder which spawns in the estuary, generally from February through June.

The proposed dredging (2400 cubic yards) of the new inlet is scheduled to be undertaken from August 2006 – November 2006. Since adults and juveniles of the above-listed species are mobile, it is expected that they will avoid the areas of disturbance and therefore will not be impacted. Winter flounder, however, spawn during the months immediately prior to the time that construction will be occurring. Since winter flounder lay demersal eggs, there is a potential that the construction activities will adversely impact eggs in the proposed areas of disturbance. The area of winter flounder EFH disturbance is relatively small scale (0.2 acres) compared to the suitable habitat available to winter flounder adjacent to the project site within Delaware Bay. In a worst case scenario, 0.2 acres containing winter flounder eggs will be adversely impacted for one season. The affected area would be available for deposition of winter flounder eggs in subsequent years after the dredging activities are completed

Cumulative Effects on Essential Fish Habitat: We do not anticipate any cumulative effects associated with this project on EFH and managed species.

Conclusion: Based upon the project design, the minimal short-term impacts associated with the construction of the new channel and jetty, the Corps believes that the potential adverse impacts to EFH will not be substantial.

6.4 Wildlife Resources

The proposed project would have little to no impact on most wildlife surrounding the emergent marsh. Beach and dune habitat associated with the excavation of the proposed channel would be converted to estuarine open water. However, dune habitat would be replaced at the existing site of the Pond Creek outlet channel. Adjacent uplands and ponds would not be impacted by the project. The spoil pile, which currently provides no wildlife habitat, would be reclaimed by spreading excavated organic material on the spoil pile to improve soil conditions and replanted with vegetation. Ultimately the spoil piles would be significantly improved as wildlife habitat due to the proposed project.

The primary purpose of the proposed project of restoring tidal inundation to Pond Creek would convert a palustrine emergent wetland dominated by *Phragmites* to an estuarine emergent wetland dominated by a variety of beneficial estuarine vegetation such as smooth cordgrass, salt hay grass, and spike grass. As a result of restoring and improving vegetative diversity and tidal exchange into these wetlands, wildlife habitat would be significantly improved. The Pond Creek restoration project area would be used by a wide variety of waterfowl, in particular wintering black ducks. In New Jersey, black ducks winter primarily in tidal estuary systems where they feed on macroinvertebrates and aquatic vegetation. Bellrose (1976) identifies the Atlantic coast of New Jersey as part of a large wintering area for the black duck. In addition the proposed project would restore habitat for a variety of shorebirds, raptors, wading birds, and mammals, improving biological diversity within the Cape May Peninsula.

6.5 Air and Water Quality

Water quality is not expected to be significantly impacted during the construction of this project. All necessary soil erosion and sediment controls will be used during the construction of the channel, hydraulic structure, and OMWM activities to minimize project impacts to Pond Creek wetlands. In addition, the contractor will be required to complete a plan that describes measures to prevent hazardous construction materials (e.g., oils) from entering the wetlands and possibly traveling downstream. Furthermore, all construction debris will be disposed of in an appropriate manner.

The proposed project will improve dissolved oxygen (DO) levels within Pond Creek. The currently recorded DO levels are very low, which may indicate large stagnant water and poor biological exchange within the wetland. Providing tidal flushing twice daily will provide a significant improvement in DO levels and subsequent biological exchange within the Pond Creek wetlands.

The proposed project is unlikely to affect the Holly Beach aquifer in the vicinity of the residential areas, which are south of the railroad tracks and east of remaining freshwater areas, in part because wetlands within the vicinity of the shallow water wells will remain freshwater wetlands and are not impacted by the proposed project. However, as part of the project implementation, shallow water wells in the vicinity of the project area will be monitored prior to initiation of the project and following project implementation to evaluate salt water intrusion. If monitoring results indicated saltwater intrusion in shallow water wells, due to the construction of this project, mitigating action will be taken.

Temporary impacts to the aesthetics of the project area will occur during improvement operations. Air quality impacts resulting from the release of carbon monoxide and particulate emissions will occur at the site during project related activities and may be considered offensive, but are generally not considered far-reaching. Exhaust from the construction equipment will have an effect on the immediate air quality around the construction operation but should not impact areas away from the Pond Creek project. These emissions will subside upon cessation of operation of heavy equipment.

General Conformity Review and Emission Inventory
Pond Creek

The 1990 Clean Air Act Amendments include the provision of Federal Conformity, which is a regulation that ensures that Federal actions conform to a nonattainment area's State Implementation Plan (SIP) thus not adversely impacting the area's progress toward attaining the National Ambient Air Quality Standards (NAAQS). In the case of the Pond Creek Salt Marsh Restoration Project, the Federal action is to restore a native salt marsh. The U.S. Army Corps of Engineers, Philadelphia District would be responsible for construction. Cape May County, New Jersey within which the Federal action will take place is classified as moderate nonattainment for ozone (oxides of nitrogen [NOx] and volatile organic compounds [VOCs]). The Pond Creek project site is within the Philadelphia-Wilmington-Trenton Nonattainment Area (PA-NJ-DE-MD).

There are two types of Federal Conformity: Transportation Conformity and General Conformity (GC). Transportation Conformity does not apply to this project because the project would not be funded with Federal Highway Administration money and it does not impact the on-road transportation system. GC however is applicable. Therefore, the total direct and indirect emissions associated with the Pond Creek project must be compared to the GC trigger levels presented below.

Pollutant	General Conformity Trigger Levels (tons per year)
NOx	100
VOCs	50

To conduct a general conformity review and emission inventory for Pond Creek, a list of equipment

necessary for construction was identified. Pertinent pieces of equipment include: a dewatering pump, bulldozers (various), front loaders, cranes (various), and welders. Table 1 (Appendix E) lists these pieces of equipment along with the number of engines, engine size (hp), and duration of operation. A Load Factor (LF) was also selected for each engine, which represents the average percentage of rated horsepower used during a source's operational profile. Load factors were taken from other General Conformity Reviews and Emission Inventories.

Table 1 (see Appendix E) shows the estimated hp-hr required for each equipment/engine category. Hp-hr was calculated using the following equation:

hp-hr = # of engines*hp*LF*hrs/day*days of operation

The second calculation is to derive the total amount of emissions generated from each equipment/engine category by multiplying the power demand (hp-hr) by an emission factor (g/hp-hr). The following equations were used:

emissions (g) = power demand (hp-hr) * emission factor (g/hp-hr)

emissions (tons) = emissions (g) * (1 ton/907200 g)

Table 2 (see Appendix E) provides the NOx and VOC emission factors selected for each equipment/engine category. These factors were also taken from other General Conformity Reviews and Emission Inventories. Tables 3 and 4 (see Appendix E) present the emission estimates for NOx and VOCs, respectively. The tables present the emissions from each individual equipment/engine category and the combined total.

The total estimated emissions that would result from construction of the Pond Creek project are 5.3 tons of NOx and 0.9 tons of VOCs. Construction will continue for 9 months, so the emissions over any 12 month period is estimated to be 7.1 tons of NOx and 1.2 tons of VOCs. These emissions are below the General Conformity trigger levels of 100 tons of NOx and 50 tons of VOCs per year. General Conformity under the Clean Air Act, Section 176 has been evaluated for the project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project because the total direct and indirect emissions from the project are below the conformity threshold values established at 40 CFR 93.153 (b) for ozone (NOx and VOCs) in a moderate Nonattainment Area (100 tons NOx per year/50 tons of VOCs per year). The project is not considered regionally significant under 40 CFR 93.153 (i).

6.6 Threatened and Endangered Species

A 0.1 acre area of beach would be excavated to construct the outlet channel for the Pond Creek restoration project. However, this limited impact is unlikely to substantially affect the overall habitat availability of beach nesting habitat within the project area. As such, piping plovers would not be adversely affected by project implementation (see Intra-Service Section 7 biological evaluation forms - Appendix A). The federally listed threatened bald eagle (*Haliaeetus leucocephalus*) is a transient visitor of the project area and may forage in open water areas near the project area. The proposed project will improve foraging opportunities for bald eagles by providing additional fish habitat within the project area.

Restoring estuarine wetlands within Pond Creek will improve habitat for these State-listed species. Several State-listed species also occur in the palustrine headwater areas of Pond Creek. The proposed project will

not affect these freshwater areas and will not have an adverse impact on these State-listed species found in the area (northern harrier, short-eared owl, osprey, and black rail).

6.7 Hydraulics and Hydrology

The UNET model was run with eight Delaware Bay storm hydrographs as the downstream boundary condition and the results are provided in Table 7. The plan of improvement will be designed so it does not produce frequency marsh water surface elevations greater than those found in Table 5 (existing conditions).

Table 8
Without Water Control Structure – Water Surface Elevations (WSEL) of the Interior Marsh (ft-NAVD)

Storm Event	Bay WSEL (ft-NAVD)	Maximum WSEL North Marsh (ft-NAVD)	Maximum WSEL South Marsh (ft-NAVD)
2yr	3.6	1.47	1.47
5yr	4.0	1.52	1.52
10yr	4.9	1.66	1.66
20yr	5.7	1.85	1.76
50yr	6.9	2.88	2.54
100yr	7.6	4.35	4.16
200yr	8.3	8.3	8.3
500yr	9.3	9.3	9.3
Daily	3.3	1.38	1.38

Model Assumptions:
- The culvert across the spoil pile is assumed not to breach.
- These wsels reflect the 2000 site condition.
- The south marsh is connected to the north marsh by two 18 inch culverts and the RR track serving as a weir with a length greater than 1200 ft and elevation of 4.1 ft.
- The UNET model included overtopping but non-breaching flow of the downstream section of the spoil pile for the 50-yr and 100-yr events.

A water control structure was the selected method of protection and a plan of improvement was designed to provide maximum daily inundation of the north marsh while minimizing interior water levels due to Delaware Bay storms. The crest elevations of both the levee on the north spoil pile and of the hydraulic structure were specified as elevation 10.6 ft. This is 1.3 ft higher than the 500-year water surface elevation (wsel) and 3 ft higher than the 100-year water surface elevation. Elevation 10.6 is slightly lower than the elevation of the dunes fronting the bay.

The project is designed to reduce flooding. Current conditions at the site provide local residents with protection from Delaware Bay storms at the 20-year level. When completed, the selected alternative will provide local residents with Delaware Bay storm protection to the 500-year level. The proposed project would provide a significant improvement in the protection of local residents from Delaware Bay storms and associated flooding from those events.

6.8 Socioeconomics

The proposed project will improve ecological viability of the Pond Creek wetlands by restoring these wetlands to its original functions and values. The proposed project will also provide additional recreational opportunities within Higbee Beach Wildlife Management Area by providing improved hunting, fishing, and bird-watching.

Additional bird-watching venues such as the Pond Creek restoration project will assist in driving the local economy. Tidal inundation and the subsequent biological control of mosquitoes will help minimize mosquito breeding habitat and minimize chemical control of mosquito larvae, which will also indirectly help tourism in Cape May.

The proposed project will provide additional recreational opportunities for residents and visitors of Cape May and will help minimize mosquito breeding habitat within the project area. Otherwise the proposed project will have no affect on socioeconomics in the project area.

6.9 Historic and Cultural Resources

There are no historic resources (including prehistoric and historic sites, buildings, districts, or objects) which are listed or eligible for listing on the National Register of Historic Places (NRHP) in the vicinity of Pond Creek and as such the proposed project will not affect any historic or cultural resources. In a correspondence dated July 27, 2004 (Appendix C) the New Jersey State Historic Preservation Office concurred with our findings that there are no historic properties within the project's area of potential effects. Consequently, pursuant to 36 CFR 800.4(d)(1), no further Section 106 consultation is required unless additional resources are discovered during project implementation pursuant to 36 CFR 800.13.

6.10 Land Use

The proposed project will not have an affect on land use within the project area.

6.11 Cumulative Impacts

The Pond Creek Salt Marsh Restoration project will generate cumulative impacts of a regional nature. The Pond Creek wetlands currently provide limited habitat for fish and wildlife resources due to the overwhelming presence of dense stands of *Phragmites*, which limit habitat value for fish and wildlife. Reducing or eliminating *Phragmites* over hundreds of acres is intended to improve habitat value and diversity. Included in this assessment are other planning and/or construction projects that are currently being undertaken in the vicinity of the Pond Creek project having or potentially impacting the natural resources of Cape May area. A brief summary of these projects are listed below.

U.S. Army Corps of Engineer Projects:
Lower Cape May Meadows (approx. 5 miles from Pond Creek): This is an ecosystem restoration project involving both beach nourishment and freshwater wetland restoration activities. The goals of the project are to improve the quality of the wetlands by reducing saltwater intrusion, increasing water movement through the site, and replacing *Phragmites* with more valuable wetland species. The Beachfill component of this project was completed March 2005. The *Phragmites* removal component of this plan is currently being completed with the planting of native vegetation. Phase II of the *Phragmites* removal, as well as improvements to the internal hydrology, is scheduled for the winter of 2005/2006.

Pine Mount Creek Restoration Project (approx. 15 miles from Pond Creek): This ecosystem restoration project involves the restoration of a freshwater impoundment and fish passage for river herring in the Cohansey River watershed. In addition, through the construction of water control structures, the project will manage impoundment water levels to benefit both estuarine and freshwater species. The project is planned for 2007.

Other restoration projects in the Cape May area:
Green Creek Salt Marsh Restoration Project (approx. 8 miles from Pond Creek): This salt marsh restoration project was completed by the State of New Jersey and the Cape May Mosquito Commission in the late 1990s. This project involved the breaching of a man-made dune and the flooding of a *Phragmites* marsh. This project restored approx. 50 acres of intertidal salt marsh.
PSE&G Estuary Enhancement Program (EEP) (approx. 15 miles from Pond Creek): The EEP involves restoration, enhancement and/or preservation of more than 20,000 acres of wetlands in the Delaware Estuary and offering unique public use opportunities. Restoration sites in Cape May County include Eldora and Heislerville.

Summary and Conclusions
The restoration plan for the Pond Creek project has been considered in the context of other ecosystem restoration projects in the Cape May area. In the context of these other projects currently being undertaken in the region, the Pond Creek project will add to their positive impacts on the natural resources which will result in hundreds of acres of restored wetlands. The juxtaposition of these acres within the known ranges of resident bird species and the annual fall/spring migrants will result in cumulative gains in forage and roosting habitats, reduction in functional fragmentation of these habitats, and reductions in predator pressures through dispersal of foraging activities for avian species in the Cape May area. This is especially important to migratory birds since Cape May is an integral part of the Atlantic Flyway.

In addition, as a result of restoring and improving vegetative diversity and tidal exchange into these wetlands, wildlife habitat would be significantly improved. Furthermore, fishery resources will also benefit from the increase in habitat acres open by the conversion of *Phragmites* to a tidal estuarine marsh. Foraging and refuge areas will increase for fishery resources in a tidal estuarine marsh with the increase in channels and open water as opposed to the confined, monoculture *Phragmites* marsh.

As discussed in the previous sections, there are no long-term adverse effects predicted to occur to the aquatic or upland ecosystem as a result of the implementation of the recommended plan. Overall, the Pond Creek project, as well as the other project listed above, will add cumulatively positive impacts to the natural resources of the Cape May area.

7.0 Environmental Justice

All of the alternatives, including the selected plan, identified in this study are expected to comply with Executive Order 12989-Environmental Justice in Minority Populations and Low-Income Populations, dated February 11, 1994. The selected plan is not located in close proximity to a minority or low-income community, and no impacts are expected to occur to any minority or low-income communities in the area.

8.0 Relationship of Selected Plan to Environmental Requirements, Protection Statutes, and Other Requirements

Compliance with environmental quality protection statutes and other environmental review requirements is ongoing. Table 8 provides a listing of compliance with environmental statutes. The Service and Corps will

apply for the necessary state permits, including but not limited to, a Coastal Zone Management Plan consistency determination from the New Jersey Department of Environmental Protection. In addition, the Service and the Corps, through the EA process, will obtain a State water quality certificate.

Table 9. Compliance with Appropriate Environmental Quality Protection Statutes and Other Environmental Review Requirements.

STATUTE	COMPLIANCE STATUS
Clean Water Act	Partial*
Endangered Species Act	Full
Fish and Wildlife Coordination Act	Full
National Historic Preservation Act	Full
National Environmental Policy Act	Partial*
Clean Air Act	Full

NOTE:
Full Compliance: Having met all requirements of the statute, E.O., or other environmental requirements for the current stage of planning.
Partial Compliance: Some requirements of the statute, E.O., or other policy and related regulations remain to be met.
*All applicable laws and regulations will be fully complied with upon completion of the environmental review, obtaining State water quality certification, coastal zone consistency determination, and concurrence with our determination on cultural resources.
Noncompliance: None of the requirements of the statute, E.O., or other policy and related regulations remain to be met.

9.0 Section 404(b)(1) Analysis

A review of the impacts associated with discharges to waters of the United States for the Pond Creek Salt Marsh Restoration Project in Cape May, New Jersey is required by Section 404(b)(1) of the Clean Water Act, as amended (Public Law 92-500).

I. Project Description

A. Location. The project area is located on Pond Creek, Cape May, New Jersey (Figure 1).

B. General Description. The Pond Creek marsh (totaling 417 acres) is located along the Delaware Bay and runs north of Sunset Boulevard in Lower Township and in the Borough of West Cape May, Cape May County, New Jersey. The marsh, once a free-flowing estuarine tidal marsh before human disturbance, is part of the State of New Jersey's Higbee Beach Wildlife Management Area. The State's Division of Fish and Wildlife currently manages the marsh for migratory bird and waterfowl habitat and human recreation (e.g., birding and hunting).

C. Purpose. The purpose of the Pond Creek Salt Marsh Restoration Project is to restore estuarine intertidal emergent wetland habitat for fish and wildlife resources and to protect freshwater wetlands for threatened and endangered species and migratory birds. This will be accomplished by reintroducing tidal flushing in the lower marsh areas of Pond Creek to eliminate and control common reed (*Phragmites australis*), an exotic and invasive species which has formed an extensive, dense stand throughout most of Pond Creek marsh. Once established, *Phragmites* often out competes native salt marsh vegetation, creating habitat less suitable for wildlife. Control of common reed will allow the reestablishment of native salt marsh vegetation [e.g.,

smooth cordgrass (*Spartina alterniflora*), salt hay grass (*S. patens*), and spike grass (*Distichlis spicata*)], thus increasing habitat available for a variety of fish and wildlife resources, in particular, the diamondback terrapin (*Malaclemys terrapin*), egrets, herons, shorebirds, and waterfowl.

D. General Description of Dredged or Fill Material.

1. General Characteristics of Material: sand/soil

2. Quantity of Discharge: This alternative involves excavating a new 920-foot-long channel with a bottom width of 20 feet and lowering the channel elevation from 1 ft to -6 ft to increase the volume of water entering the marsh. The estimated volume of excavated material is 13,000 cubic yards (cys) (2400 cys with a dredge) for the new channel and 26,000 cys within the spoil pile. The channel will also go 154 ft into Delaware Bay from mean average tide (elev. 1.8).

3. Source of Material: existing area behind sand dunes and north spoil pile.

E. Description of Discharge Sites.

Location: The excavated sand material will be used to plug the opening of the existing channel. Any additional material will be placed on the existing upland spoil pile. Ditching inside the existing *Phragmites* marsh will be needed to facilitate the new water flow throughout the marsh.

2. Size (acres): 3 (includes main channel excavation, plugging existing channel, channel material storage, new jetty construction, and interior marsh ditching).

3. Type of Sites: *Phragmites* marsh

4. Type of Habitat: freshwater marsh

5. Timing and Duration of Discharge: 4 months

F. Description of Discharge Method. Excavation of the new channel and plugging of the existing channel opening.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations.

1. Substrate Elevation and Slope: varies

2. Sediment Type: sand/soil

3. Fill Material Movement: Significant, excavate a new channel and use the material to plug existing the channel opening. Additional material excavated within the north spoil pile will be placed on the adjacent upland spoil pile areas.

4. Physical Effects on Benthos: Temporary, significant effect on flow and patterns when the new channel is being constructed and when completed. The area should reach a stabilized equilibrium in a relatively short time period.

5. Actions taken to Minimize Impacts: Best management practices will be used to minimize any disturbance to only the area necessary to construct the new channel, new inlet, and the associated ditching.

B. Water Circulation, Fluctuation and Salinity Determinations.

1. Water:

a. Salinity – Increase salinity in the Pond Creek marsh.

b. Water Chemistry – temporary, minor effect.

c. Clarity – temporary, minor effect

d. Color - No effect

e. Odor – No effect.

f. Taste - No effect.

g. Dissolved Gas Levels – No effect.

h. Nutrients – No effect

I. Eutrophication - No effect.

j. Temperature- No effect.

2. Current Patterns and Circulation:

a. Current Patterns and Flow – Temporary, significant effect on flow and patterns when the new channel and inlet is being constructed and when completed. The area should reach a stabilized equilibrium in a relatively short time period.

b. Velocity - Temporary, significant effect on flow and patterns when the new channel is being constructed and when completed. The area should reach a stabilized equilibrium in a short time period.

c. Stratification - No effect.

3. Normal Water Level Fluctuations – Temporary, significant effect on flow and patterns when the new channel is being constructed and when completed. The area should reach a stabilized equilibrium in a short time period.

4. Salinity Gradients – Increased salinity in the Pond Creek marsh.

5. Actions That Will Be Taken To Minimize Impacts: Best management practices will be used to minimize any disturbance to only the area necessary to construct the new channel, new inlet, and associated ditching.

C. Suspended Particulate/Turbidity Determinations.

1. Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Fill Site: Temporary, major effect during the construction of the new channel and inlet.

2. Effects on Chemical and Physical Properties of the Water Column:

a. Light Penetration: Minor effect.

b. Dissolved Oxygen: Minor effect.

c. Toxic Metals and Organics: No effect.

d. Pathogens: No effect.

e. Aesthetics: Minor adverse and temporary effects limited to the construction period.

f. Temperature: No effect.

3. Effects on Biota:

a. Primary Production, Photosynthesis: Temporary, significant effect on flow and patterns when the new channel is being constructed and when completed. The area should reach a stabilized equilibrium in a short time period.

b. Suspension/Filter Feeders: Temporary, significant effect on flow and patterns when the new channel is being constructed and when completed. The area should reach a stabilized equilibrium in a short time period.

c. Sight feeders: Temporary, significant effect on flow and patterns when the new channel is being constructed and when completed. The area should reach a stabilized equilibrium in a short time period.

4. Actions Taken to Minimize Impacts: Best management practices will be used to minimize any disturbance to only the area necessary to construct the new channel, new inlet, and the associated ditching.

D. Contaminant Determinations.

No significant contaminants were found on site that would impact this project (Louis Berger 2000).

E. Aquatic Ecosystem and Organism Determinations.

1. Effects on Plankton: No effect.

2. Effects on Benthos: Temporary, significant effect on flow and patterns when the new channel is being constructed and when completed. The area should reach a stabilized equilibrium in a short time period.

3. Effects on Nekton: No effect

4. Effects on Aquatic Food Web: Temporary, significant effect on flow and patterns when the new channel is being constructed and when completed. The area should reach a stabilized equilibrium in a short time period.

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5. Effects on Special Aquatic Sites:
   (a) Sanctuaries and Refuges: None.

   (b) Wetlands: Major Impacts (1.3 acres) - loss will result from the construction of new channel and inlet. Low quality *Phragmites* marsh would be impacted. However, the goal of the project is to restore a *Spartina* dominated estuarine tidal marsh. The selected plan will restore approximately 270 acres of *Spartina* marsh.

   (c) Tidal flats: None.

   (d) Vegetated Shallows: None.

6. Threatened and Endangered Species: No effect.

7. Other Wildlife: Temporary, minor effect.

8. Actions to Minimize Impacts: Best management practices will be used to minimize any disturbance to only the area necessary to construct the new channel and inlet.

F. Proposed Disposal Site Determinations.

1. Mixing Zone Determinations:
   a. Depth of water: 6- 8 ft
   b. Current velocity:
   c. Degree of turbulence:
   d. Stratification:
   e. Discharge vessel speed and direction: TBD
   f. Rate of discharge: TBD
   g. Dredged material characteristics: sand

2. Determination of Compliance with Applicable Water Quality Standards:
   A section 401 Water Quality Certificate will be obtained from NJDEP prior to construction of the project.

3. Potential Effects on Human Use Characteristics:

a. Municipal and Private Water Supply: No effect.

b. Recreational and Commercial Fisheries: Temporary, minor effect during construction.

c. Water Related Recreation: Temporary, minor effect.

d. Aesthetics: Temporary, minor effect.

e. Parks, National and Historical Monuments, National Seashore, Wilderness Areas, Research Sites, and Similar Preserves: Temporary, minor effect.

G. Determination of Cumulative Effects on the Aquatic Ecosystem.
No significant adverse effects are anticipated.

H. Determination of Secondary Effects on the Aquatic Ecosystem.
No significant secondary effects are anticipated.

III. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

A. Adaptation of the Section 404(b)(1) Guidelines to this evaluation - No significant adaptation of the guidelines were made relative to this evaluation.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem - The selected plan was determined from a detailed evaluation of alternatives to have the least amount of environmental impacts.

C. Compliance With Applicable State Water Quality Standards - The selected plan is not expected to violate any applicable state water quality standards in New Jersey.

D. Compliance With Applicable Toxic Effluent Standards or Prohibition Under Section 307 of the Clean Water Act - The proposed discharge is not anticipated to violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

E. Compliance With Endangered Species Act of 1973 -The selected plan will comply with the Endangered Species Act of 1973. Informal Section 7 consultation has been completed with the U.S. Fish and Wildlife Service on this project.

F. Compliance With Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972 - No Marine Sanctuaries, as designated in the Marine Protection, Research, and Sanctuaries Act of 1972, are located within the project area.

G. Evaluation of Extent of Degradation of Waters of the United States - The proposed project

will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, and recreational and commercial fishing, plankton, fish and shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and wildlife will not be adversely affected. Significant adverse impacts on aquatic ecosystem diversity, productivity and stability, and recreation, aesthetics and economic values will not occur as a result of the project.

H. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem - Appropriate steps (as described above) will be taken to minimize potential adverse impacts of discharging material in the aquatic ecosystem.

10.0 References

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11.0 CLEAN AIR ACT STATEMENT OF CONFORMITY

CLEAN AIR ACT STATEMENT OF CONFORMITY
POND CREEK SALT MARSH RESTORATION PROJECT
CAPE MAY COUNTY, NEW JERSEY

Based on the conformity analysis in the environmental assessment, I have determined that the selected plan conforms to the applicable State Implementation Plan (SIP). The Environmental Protection Agency had no adverse comments under their Clean Air Act authority. No negative comments from the air quality management district were received during coordination of the environmental assessment. The selected plan would comply with Section 176 (c)(1) of the Clean Air Act Amendments of 1990.

_____ _____

Date

Robert J. Ruch
Lieutenant Colonel, Corps of Engineers
District Engineer

Appendix A

Standards for Open Marsh Water Management

Appendix B

Intra-Service Section 7 Biological Evaluation Forms

Appendix C

Relevant Correspondence

Appendix D

Clean Air Assessment

General Conformity Analysis

Table 1. Project Emission Sources and Estimated Power

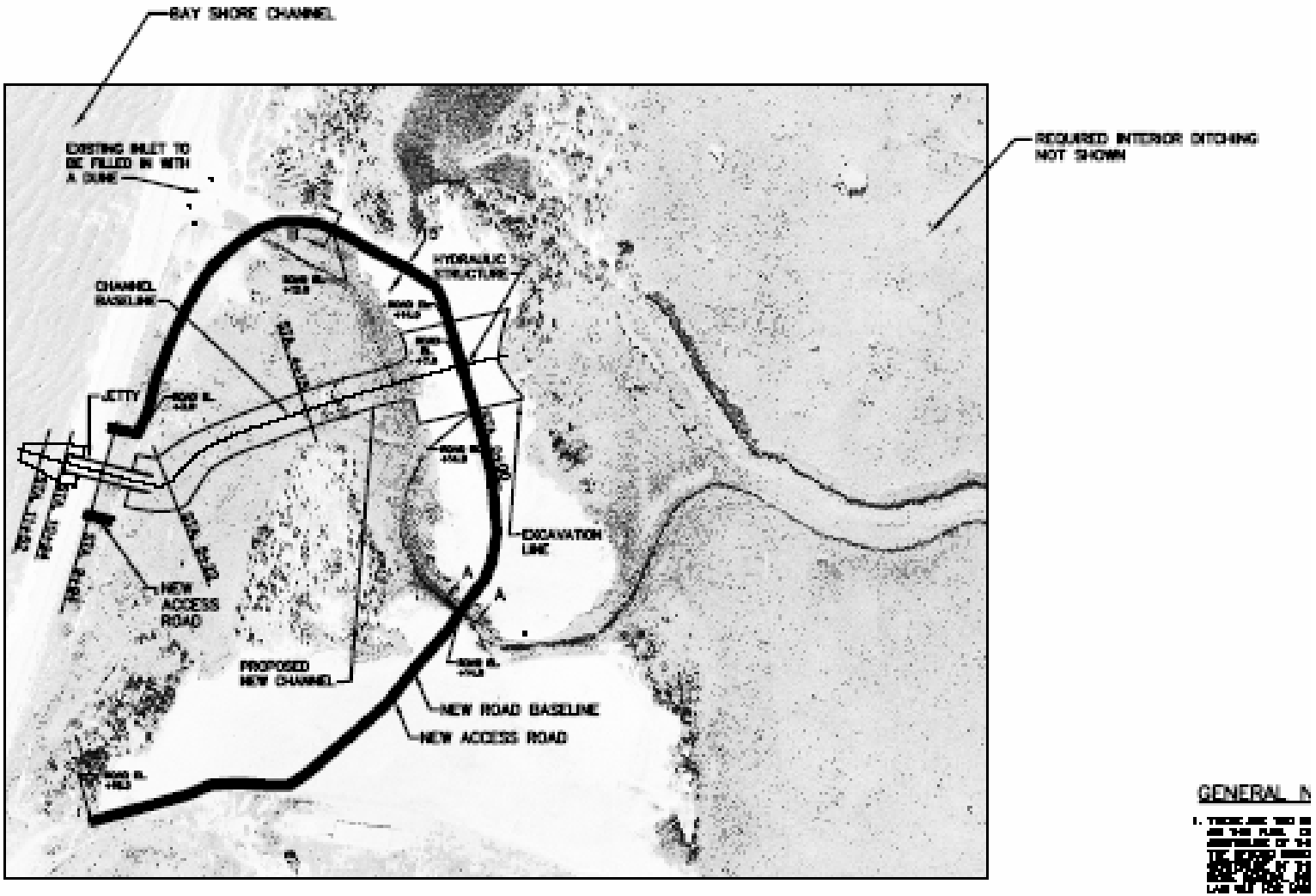
Table 2. Emission Estimates (NOx)

Table 3. Emission Estimates (VOCs)

Table 4. Pollutant Emissions from Employee Vehicles

Appendix E

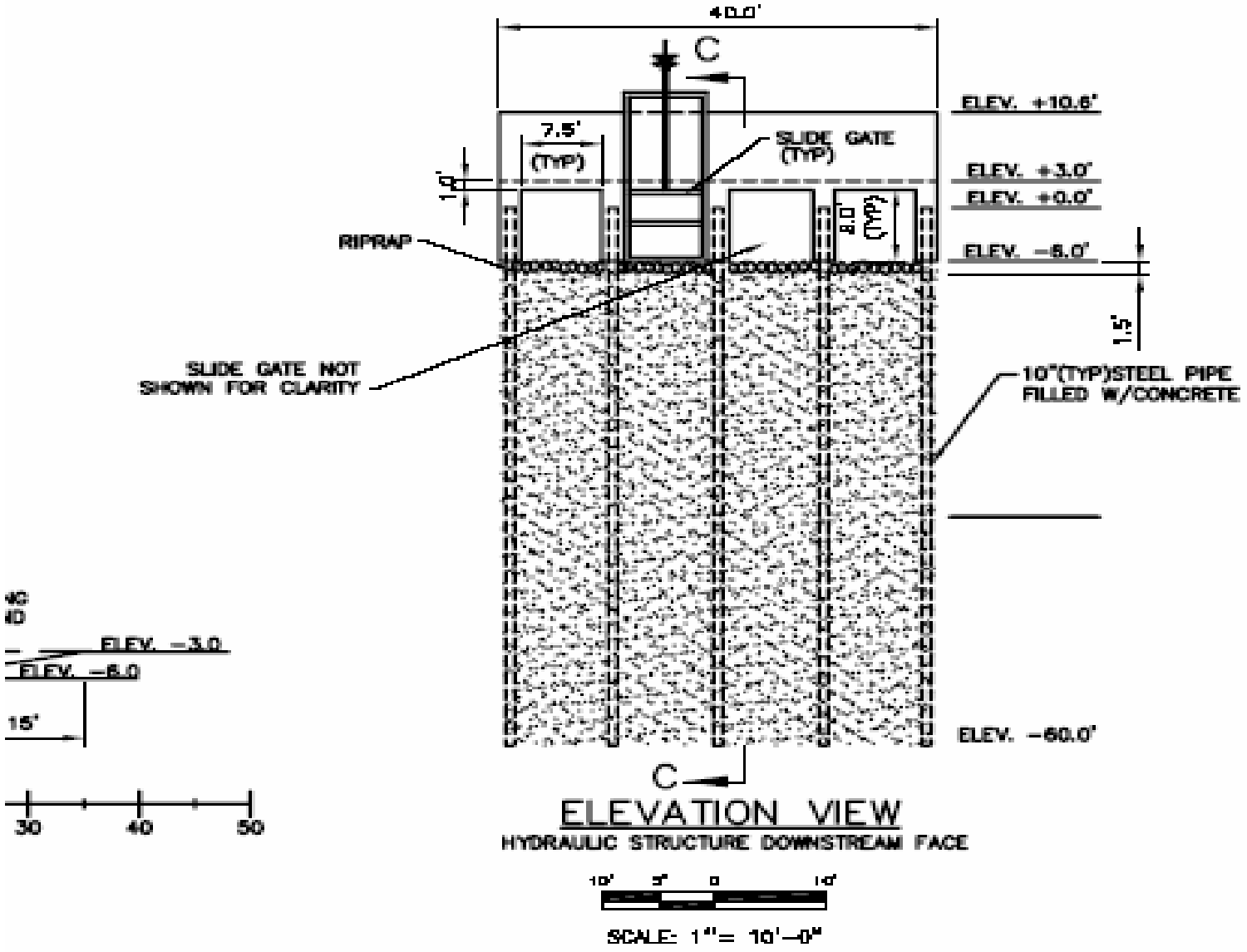
30% Project Design



PROPOSED – GENERAL PLAN

SCALE IN FEET

GENERAL N


40.0'
C
ELEV. +10.6'
7.5'
(TYP)
SLIDE GATE
(TYP)
1.0'
ELEV. +3.0'
ELEV. +0.0'
8.0'
(TYP)
RIPRAP
ELEV. -6.0'
1.5'
SLIDE GATE NOT
SHOWN FOR CLARITY
10"(TYP)STEEL PIPE
FILLED W/CONCRETE
ELEV. -3.0
ELEV. -6.0
15'
30
40
50
ELEV. -60.0'
C
ELEVATION VIEW
HYDRAULIC STRUCTURE DOWNSTREAM FACE
10'
5'
0
10'
SCALE: 1"= 10'-0"